CQ

May 1963
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. . .see page 59

The Radio Amateur's Journal

Beginning today, you can transmit and receive on 6 and 2 with one unit, the Collins 62S-1 VHF Converter, and without changing cables. The 62S-1 is a self-contained unit (using exciter's high voltage) and supplies a 3 to 5 db noise figure on receive... 160 watts PEP input on transmit.

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COLLINS

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FUNDAMENTAL, PR TYPE Z-2—Frequency Ranges in Kcs.: 3,500 to 4,000 (80-M); 7,000 to 7,425 (40M); 8,000 to 8,-222 (2M); 8,334 to 9,000 (6M) ± 500 Cycles ...$2.95 Net

(All Z-2 Crystals calibrated with a load capacity of 32 mmfd.)

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PR Crystals

Since PR 1934

USE PR AND KNOW WHERE YOU ARE

PETERSEN RADIO COMPANY, INC.
COUNCIL BLUFFS, U.S.A.

For further information, check number 10, on page 110

Are you ready to move up to an HT-32B?

Somewhere along the line, about one of 25 amateurs reaches a "point of no return" in pursuit of this unique and wonderful activity we call ham radio.

Up to this point, his interest, his technical skills and experience have grown and broadened by leaps and bounds. He has studied or experimented with a variety of equipment — enough to know what to expect, and what he personally wants in ultimate performance.

Beyond it, average performance or the absence of needed features no longer are an inconvenience. *They are intolerable.* Beyond it, he will settle for nothing less than an uncompromising leader. The best.

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The incomparable

HT-32B

transmitter

$725.00

amateur net

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- **Hallicrafters exclusively** — complete amateur coverage capability, 80 meters through 10 meters, without changing crystals.
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The Radio Amateur's Journal

Vol. 19, No. 5 May 1963

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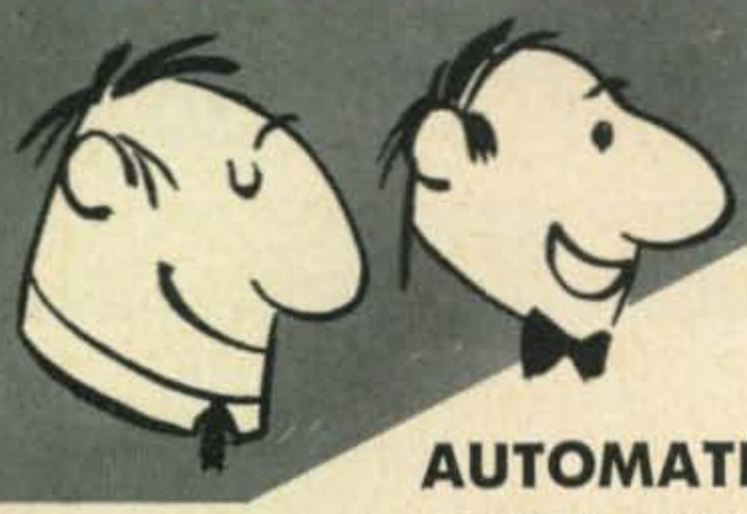

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FEATURES:

2-811A zero bias triodes in grounded grid.
750 Watts PEP.

500 Watt self contained TRANSISTORIZED DC Power Supply employing a bridge of solid state rectifiers for excellent regulation.

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Ideal linear amplifier for any 50-100 Watt SSB exciter, such as KWM-2, SWAN, HALLICRAFTERS, SONAR, etc.

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Internal antenna relay allows barefoot operation when amplifier is not in use.

Wide range PI-NET output.

Does not require additional batteries in *most* automobiles.

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MODEL RC-73 $17.95

REMOTE CONTROL: INCLUDES

Five wire remote control cable for On-Off switch, Pilot Light, Plate MA or RF Output Meter and Push-to-Talk Antenna Changeover Relay.

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For further information, check number 12, on page 110

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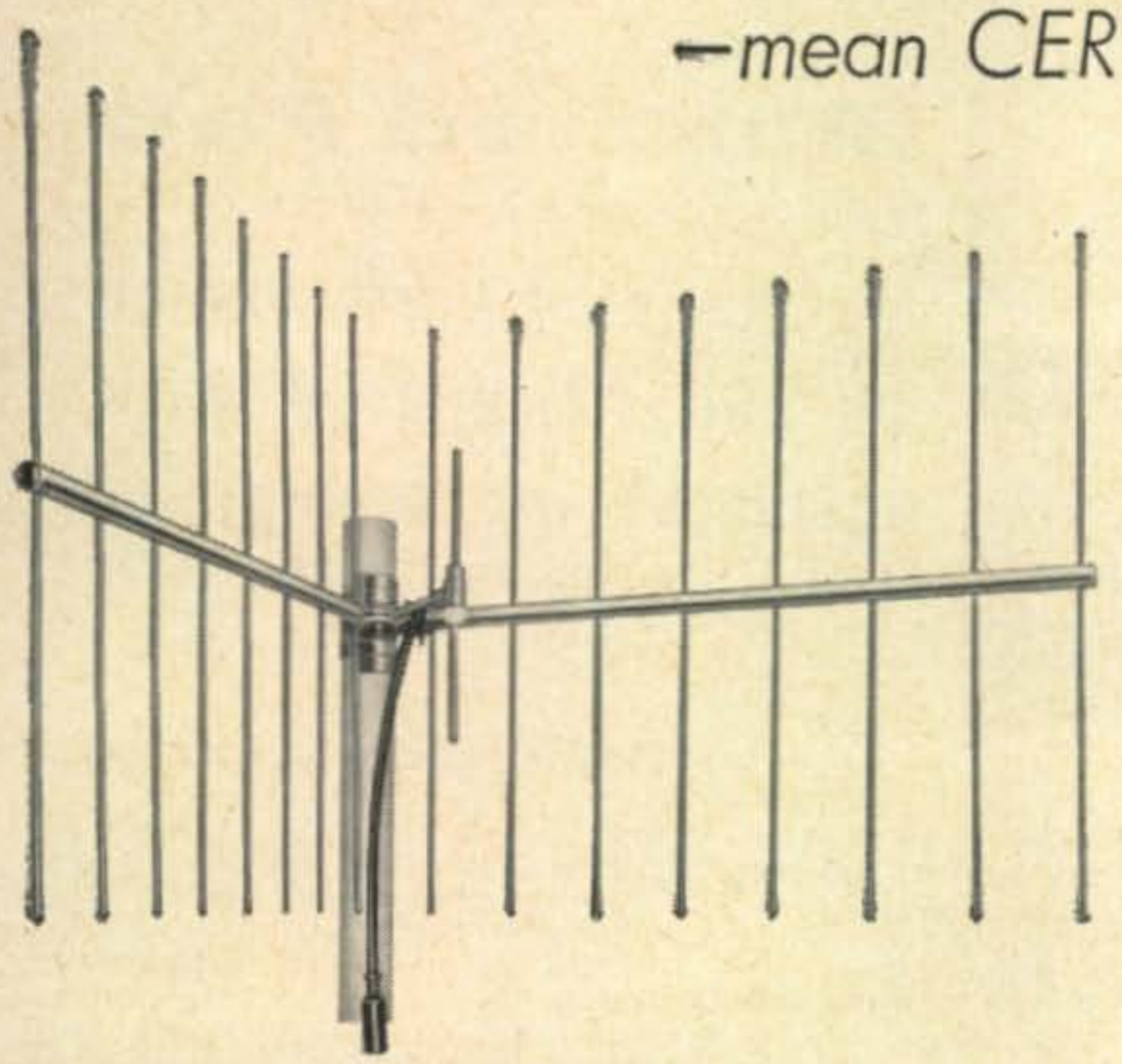


Base Station Corner Reflector Advanced Design Antenna

(10X-Unidirectional Gain)

Cat. No. 161-509, Frequency Range 450-470 MC

Cat. No. 161-509 Corner Reflector Antenna is designed for use in the 450-470 Mc band. All reflector screen components are manufactured of high strength aluminum alloys, all mounting components are fabricated of hot-galvanized steel and all radiating components are fabricated of aluminum. The above combine maximum strength, optimum electrical performance and minimum weight for the first time in an antenna of this type.

This lightweight aluminum antenna is ideal for use in multiple corner arrays.

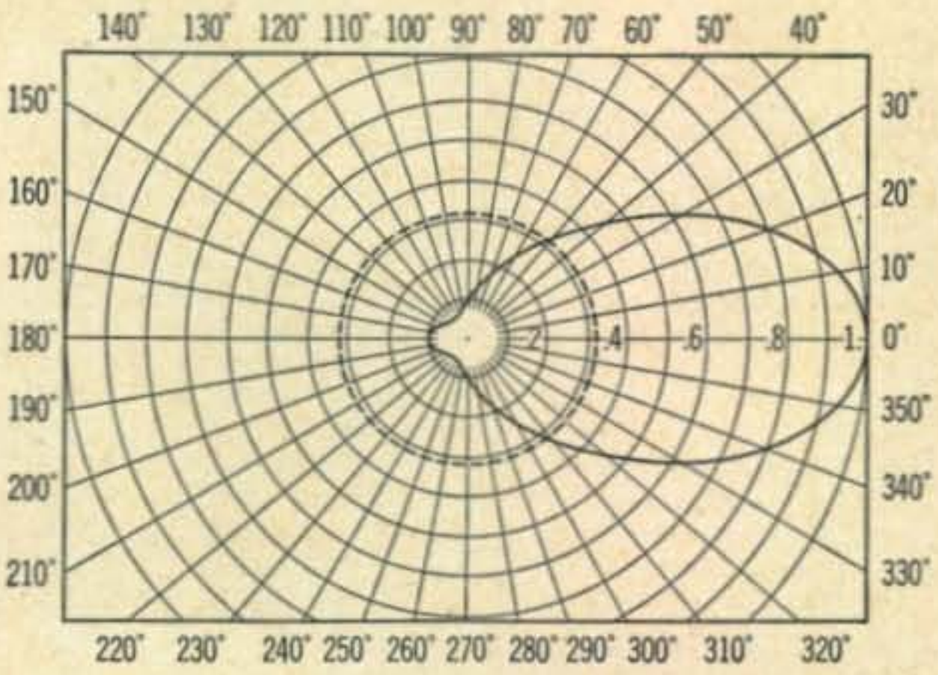
Electrical Specifications:

Nominal input impedance	50 ohms
Forward gain	10 db
Front-to-back ratio	20 db
Maximum power input	250 watts
Internal feedline	RG-8A/U
Flexible terminal extension	18" of RG-8A/U
Termination	Type N male with Neoprene housing
VSWR	1.5:1
Bandwidth	±3%
Lightning protection	Direct ground

Mechanical Specifications:

Reflector (size per side)	2' x 2'
Reflector material	High strength aluminum alloy
Radiating element material	High strength aluminum alloy
Radiating element diameter	⅜"
Rated wind velocity	100 MPH
Lateral thrust at rated wind	16 lbs.
Torsional moment on mounting pipe	16 ft. lbs.
Weight	8 lbs.

Stainless steel hardware supplied to mount antenna on 2" IPS pipe.



Horizontal field strength pattern of Corner Reflector 10X-Gain Antenna Cat. No. 161-509. A dipole pattern is shown for reference.

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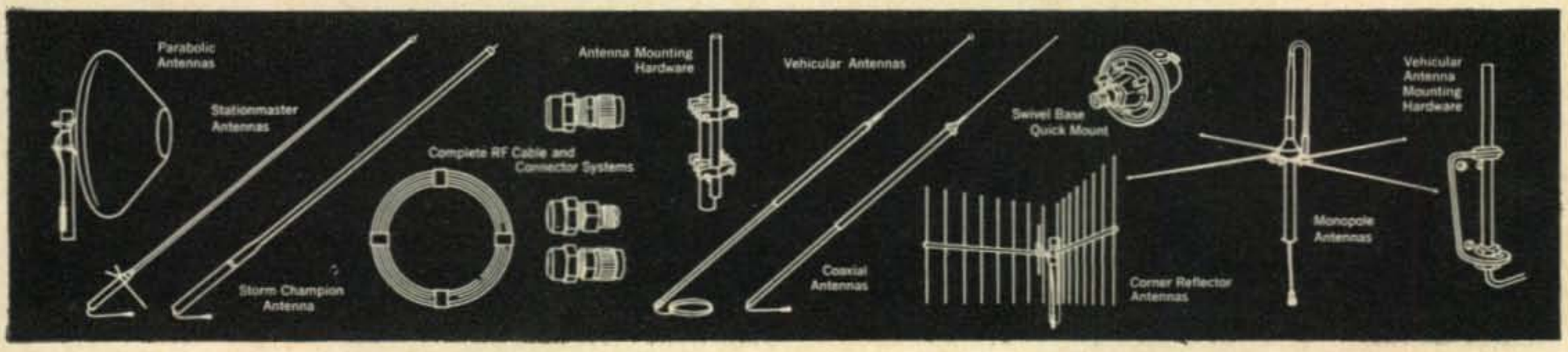

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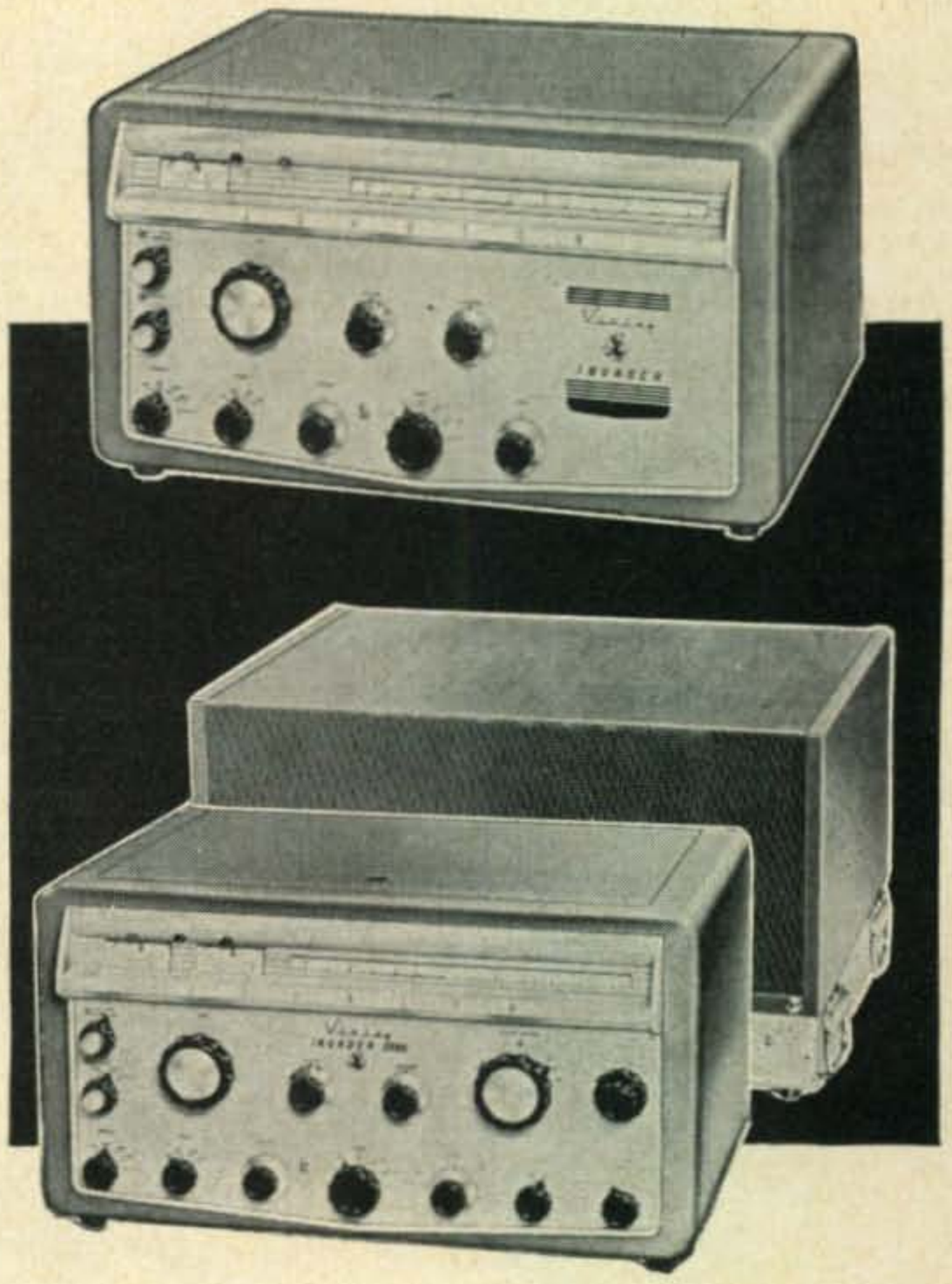

E. F. JOHNSON COMPANY
WASECA, MINNESOTA, U.S.A.

For further information, check number 13, on page 110

ZERO BIAS

By now, most of you reciprocal licensing buffs are aware that Senator Barry Goldwater of Arizona (now K7UGA) presented to the Senate on February 28th, Bill S. 920 which replaces S. 2361 introduced last year by Mr. Goldwater and the late Senator Schoeppel.

Along with Senator Goldwater, an impressive array of twenty-two Senators have also included their names to this important Bill.

The most important feature of S. 920 is the fact that the license, as required in the first Bill has now been supplanted with "licensing privileges." In essence, this means that a foreign amateur will be authorized to operate his station using his *own* call in the appropriate U. S. call areas. This privilege will be permitted provided that the United States and the alien country have entered into an agreement allowing such operation to take place.

Because a visiting amateur will *not* receive a license, it is expected that approval for operation will be swift. Likewise, should an alien operator violate FCC regulations, suspension and/or cancellation will be just as speedy.

Those of you who are aware of the many technicalities associated with the revocation of an American amateur license will understand that the FCC must apply a great deal of administrative procedures, hearings, appeals, etc., in revoking a license. S. 920 now permits the FCC to sanction foreign amateurs to operate in the United States with a minimum amount of paper work.

Similar to the treaty for the "banned country" list, the United States will be required to enter into a mutual agreement with other countries allowing exchange of amateur privileges. Should a foreign country (or the United States) decline amateurs permission to operate, that country will either refuse to sign the bi-lateral agreement, or, after it has been signed ask that it be revoked.

S. 920 contains considerably less complex wording than S. 2361 and because it has received a great deal of support from the Senate and now the ARRL, *CQ* expects that ratification may be in order this year.

88TH CONGRESS
1ST SESSION

S. 920

IN THE SENATE OF THE UNITED STATES
FEBRUARY 28, 1963

Mr. GOLDWATER (for himself, Mr. ALLOTT, Mr. BARTLETT, Mr. BENNETT, Mr. BOGGS, Mr. CURTIS, Mr. HAYDEN, Mr. HRUSKA, Mr. LAUSCHE, Mr. METCALF, Mr. MOSS, Mrs. NEUBERGER, Mr. RANDOLPH, Mr. SCOTT, Mr. SPARKMAN, Mr. TOWER, Mr. YARBOROUGH, Mr. MCINTYRE, Mr. DOMINICK, Mr. CLARK, Mr. HUMPHREY, Mr. FONG and Mr. BAYH) introduced the following bill; which was read twice and referred to the Committee on Commerce.

A BILL

To amend sections 303 and 310 of the Communications Act of 1934, as amended, to provide that the Federal Communications Commission may, if it finds that the public interest, convenience, or necessity may be served, issue authorizations, but not licenses, for alien amateur radio operators to operate their amateur radio stations in the United States, its possessions, and the Commonwealth of Puerto Rico provided there is in effect a bilateral agreement between the United States and the alien's government for such operation by United States amateurs on a reciprocal basis.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That clause (1) of section 303 of the Communications Act of 1934 (47 U.S.C. 303) is amended—[and]

SEC. 2 Subsection (a) of section 310 of the Communications Act of 1934 is amended by adding at the end thereof the following: "Notwithstanding section 301 of this Act and clauses (1) and (2) of this subsection, the Commission may issue authorizations, under such conditions and terms as it may prescribe, to permit an alien licensed by his government as an amateur radio operator to operate his amateur radio station licensed by his government in the United States, its possessions, and the Commonwealth of Puerto Rico provided there is in effect a bilateral agreement between the United States and the alien's government for such operation on a reciprocal basis by United States amateur radio operators. Other provisions of this Act and of the Administrative Procedure Act shall not be applicable to any request or application for or modification, suspension, or cancellation of any such authorization." ■

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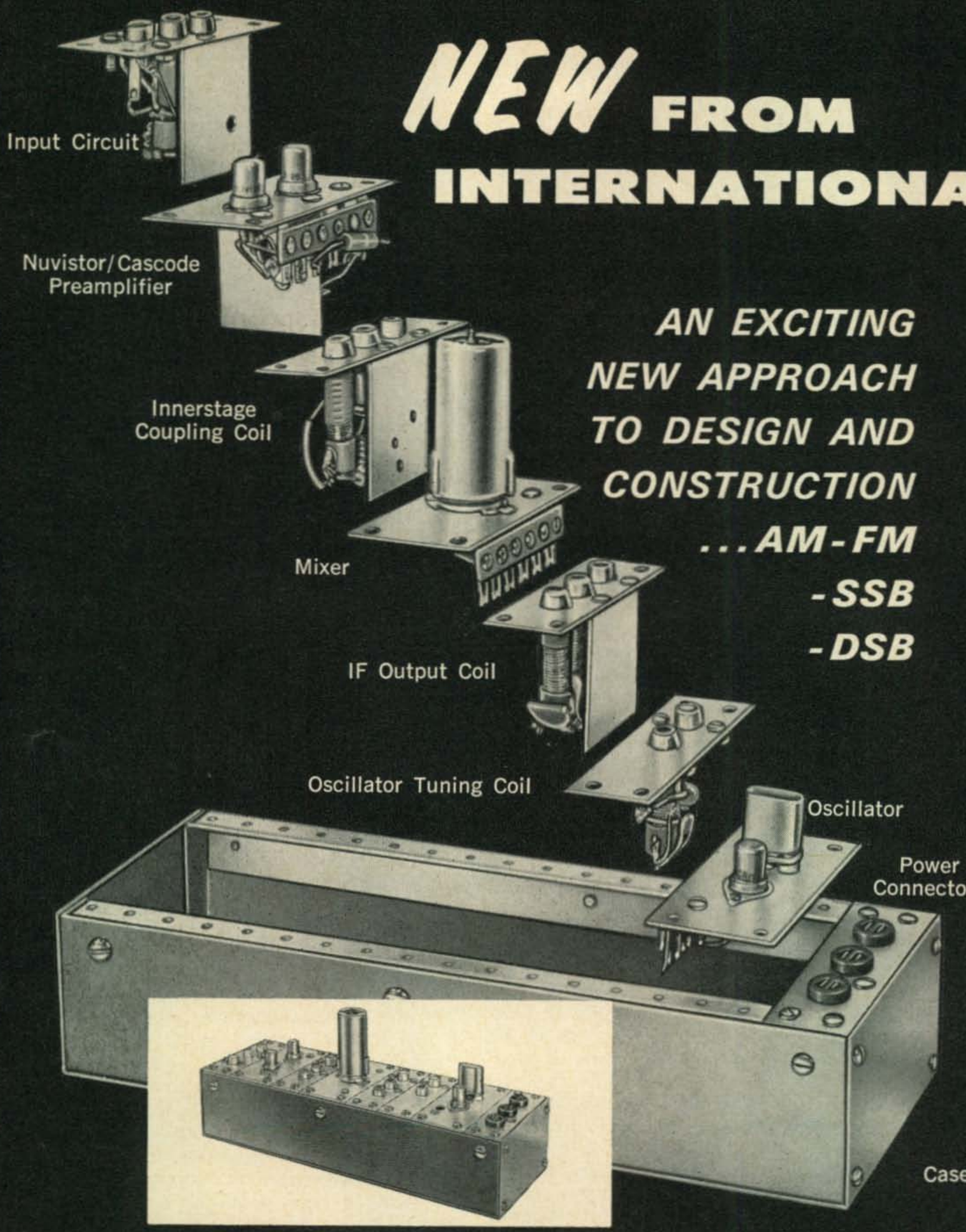
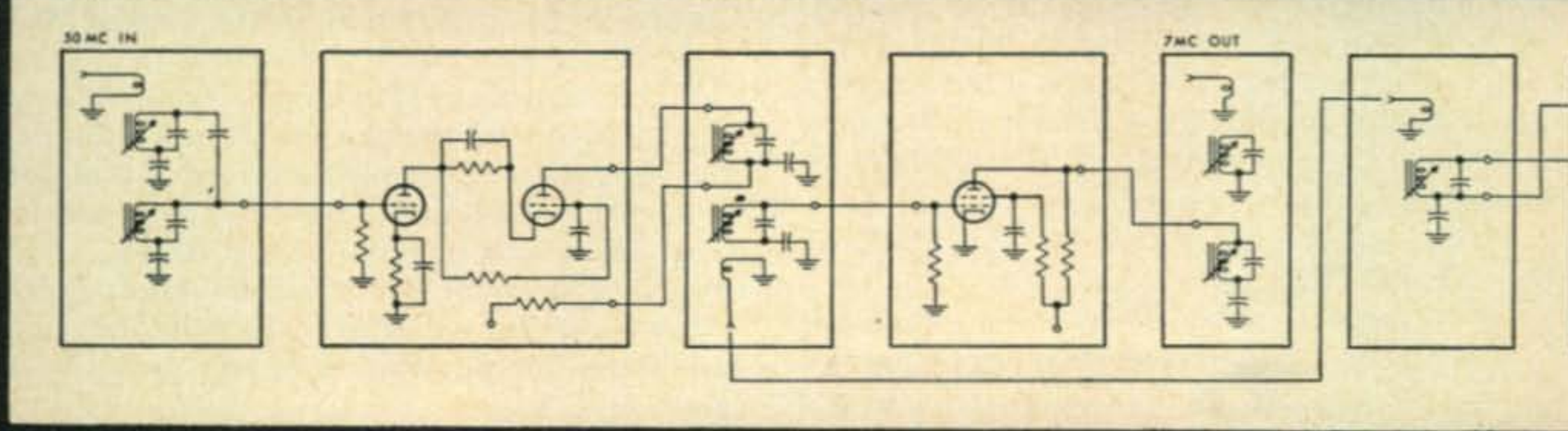
AN EXCITING NEW APPROACH TO DESIGN AND CONSTRUCTION ...AM-FM -SSB -DSB





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For further information, check number 8, on page 110

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Restricted Voice Bands

Editor, *CQ:*

It is quite obvious that your ZERO BIAS in March is from the pen of a phone man! If the phone men need more room to operate—let's outlaw a.m. . . . if the phone men want action, let the action be taken in the phone band segment. —*K8TFE*

Editor, *CQ:*

Thank you for your editorial, ZERO BIAS in March . . . it represents my feelings 100% on the matter of allocating frequencies to improve operating practices.

—*K3BZN*

Editor, *CQ:*

I would suggest that the best approach to the whole problem would be to modify the amateur examination from time to time to reflect new techniques . . . for the good of ham radio and for our own enjoyment, let us maintain a reasonable set of minimum requirements, consistent with the state of the art, but let us not drive out the non-specialists and eager youngsters that keep amateur radio a going concern. —*W6QVO*

Editor, *CQ:*

. . . your suggestion is hastily constructed and impractical. To take certain segments from everyone and give them to a minority creates incentive; but how many amateurs have time to increase their code speed and simultaneously augment their technical knowledge in order to conform to the requirements of the Extra Class license?

My advice to *CQ* is to let the League alone unless there is a genuine complaint. —*K8PSV*

Editor, *CQ:*

. . . The ARRL has not stated any details of their proposal; before putting them on the firing line why not wait and see just what form their proposal will take? —*W3AZR*

Editor, *CQ:*

To your March ZERO BIAS an unequivocal Amen. . . . —*W3KIZ*

Editor, *CQ:*

With regard to your ZERO BIAS in *CQ* for March, I was never so shocked by an editorial as I was with this one . . . if a "Utopian" solution can not be found, then why not just leave things as they are. —*WA2QYX*

Editor, *CQ:*

I think you are to be congratulated on your stand regarding the proposal offered by the ARRL relating to the reverting back to ancient standards of licensing. . . . —*W1KOC*

measure the performance...

VOX & Push-To-Talk Circuitry.

Output Power—Two-tone SSB and CW—50 watts at 10 meters to 65 watts at 80 meters for conservatively rated input of 90 watts DC, 130 watts P.E.P. AM is 25% of SSB/CW values.

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...and we are sure that you will agree that despite the new price tag we have had to put on the FABULOUS HX-50, it still gives you more dollar-for-dollar value than any other transmitter in the market today! The '50 is crammed full of outstanding features to deliver the performance you have always wanted—but have never been able to get in this price range.

Now Available! 160 Meter Band Kit for only $11.00. Or, if you prefer, this plus feature can be wired right into the unit on special order for an additional charge. NOTE: The Hammarlund HX-50 is the only commercially manufactured Amateur transmitter that presently provides 160 meter band capability.

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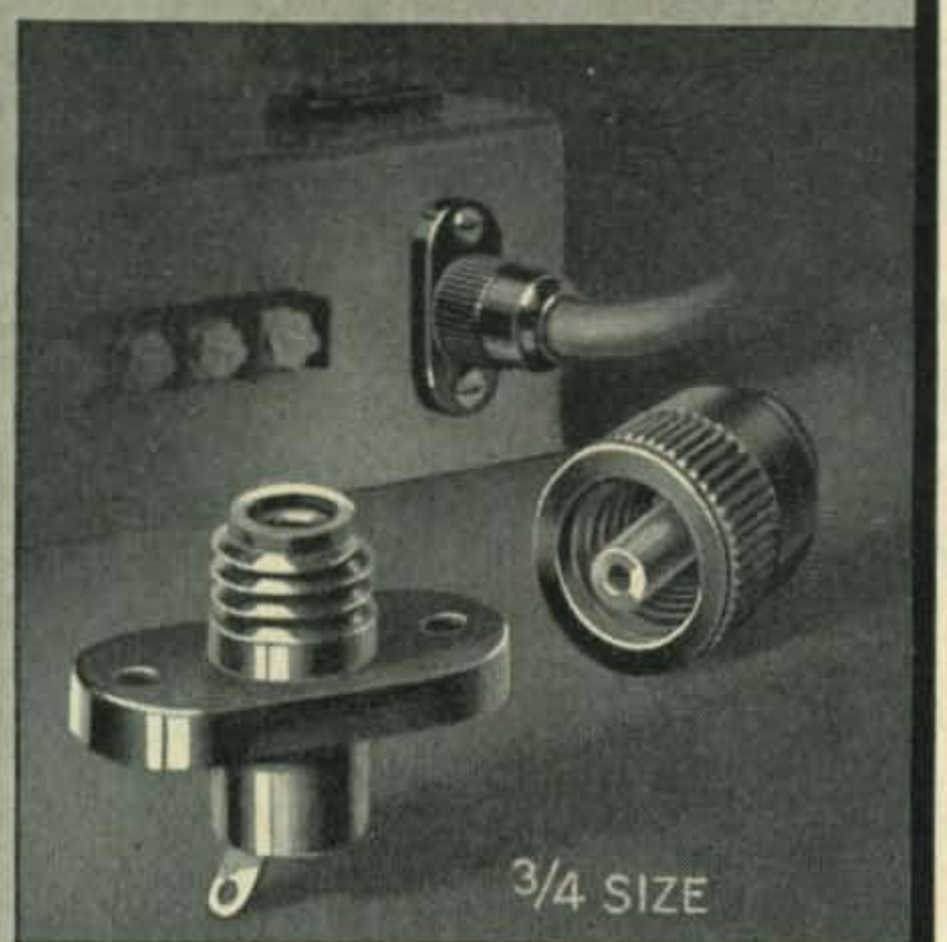

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Editor, *CQ:*

The ZERO BIAS section brings up again an enigma that should not be associated with amateur radio. I speak about the growing class distinction on today's amateur bands. . . . My solution? Eliminate *all* classes of license. Have just one exam with a 15 w.p.m. code test and a technical exam much stiffer than the simple electricity quizzes given now. Then open the bands as they now exist to one big happy family of non-status-seeking amateurs. *—K1ZSE*

Editor, *CQ:*

I would like to extend my congratulations on a fine editorial, ZERO BIAS, March 1963. I feel that an improvement in our present licensing system is in order and the ideas you have put forth are a step in the right direction. The Novice and Tech licenses which are themselves incentive licenses, are the best thing that ever happened to amateur radio. *—W8VRZ/4*

Editor, *CQ:*

I was disappointed in the presentation given under ZERO BIAS in the March issue. Whether intended as constructive criticism or not, there was a tone of "sniping," and there appeared to be a bid for the favor of a segment of the ham family who want something for nothing and/or are indifferent to the need for self-discipline.

Honest difference of opinion is healthy, but for Pete's sake let's not revert to the former childish backbiting. . . . *—W3BS*

Editor, *CQ:*

. . . Here is my remedy: Require every license holder to be re-examined every five years . . . restrict twenty meter phone to Extra Class hams only . . . eliminate the Novice license . . . [and] require the ARRL to stop printing that "phony" they call the *License Manual.* *—W8TSF/ø*

Editor, *CQ:*

. . . am 100% behind your thoughts in ZERO BIAS for March. I am working on the theory portion of the Extra Class license and hope to obtain this license in the near future. At present there are nine amateurs in this area who have been licensed over 25 years. One works c.w. and I personally know that four cannot copy *any* code. These are the ones in favor of the ARRL proposal. . . . *—K8TNE*

Editor, *CQ:*

With the coming of a new League president, progressive, alert, and responsive to the needs of the amateur fraternity, ARRL has bristled for a change; has strongly gone to the offensive to make our bands a better place to invest our time; has encouraged the amateur to be a better operator.

The League's recent proposal of incentive-licensing goes back to the American method of granting privileges to those who genuinely have earned them and, therefore, deserve them. Let's not call this a return to the old days—its not. . . . *—W4CKB*

Editor, *CQ:*

. . . ZERO BIAS? My meter shows about 900 volts negative. That's a heck of a way to run a linear! *—K3PBU/KN3UWT*

Editor, *CQ:*

. . . If the League succeeds in a plan for legislating proficiency and technical ability, most of our state Governments should be interested in applying their formula to the issuance of drivers licenses!

Various states over the years have been trying to improve the proficiency of drivers by legislating stricter drivers license requirements and vehicle inspection.

The vehicles are safer (and more powerful) but the operators are just as careless.

. . . Why not an inducement for an upward trend in band occupancy, with inducements to those already there to stay there? *—WA4AYP*

For further information, check number 32, on page 110

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designed by Hams... for Hams...

to the highest Ham standards

90-WATT CW TRANSMITTER* #720
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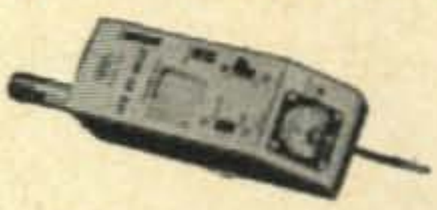

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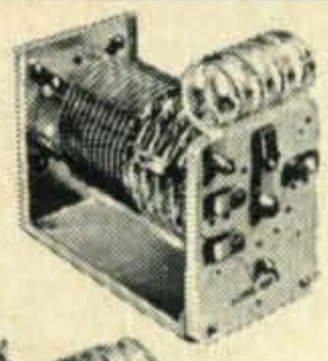
B&W

MODEL 850A
$35.00



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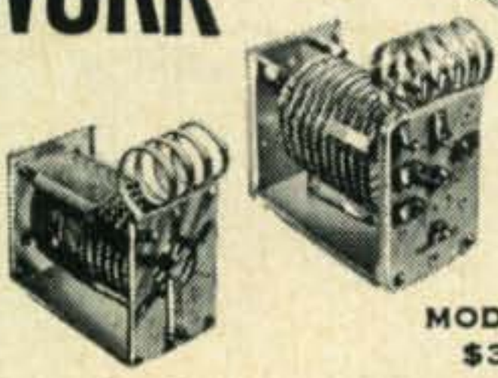

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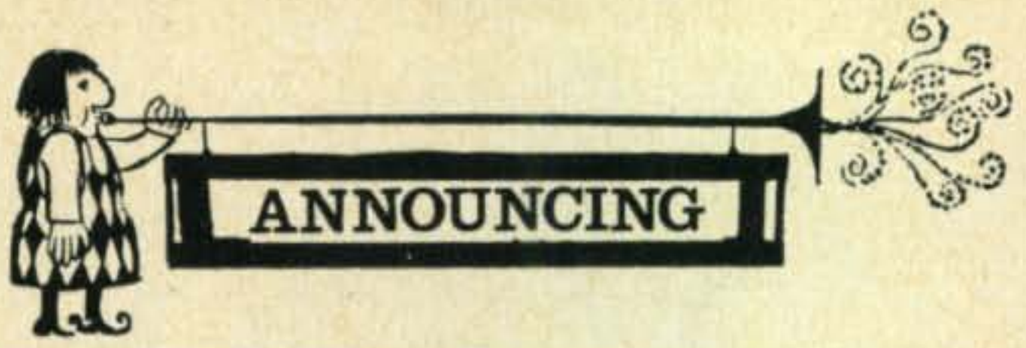

Relaxed Mobile Logging

Effective last March 21, requirements for log keeping during mobile operation were considerably relaxed. Under Docket 14853 amending Section 12.136 of the Amateur Radio Service, mobile operators may now omit dates and times of the beginning and ending of each QSO, providing *continuous* mobile operation takes place. In this regard the FCC stated: ". . . the Commission contemplates that a licensee operating mobile will maintain his log at his first practicable opportunity, such as a stop for service, food or lodging, or upon completion of a day's journey. Of course, memory limitations may require some licensees to make an occasional stop to record data necessary for the accuracy and completeness of their logs."

The amendment of Part 12 follows:

Section 12.136 is amended by addition of the following clause at the end of the first sentence in paragraph *(a)*:

". . . except that for a period of continuous mobile operation, the time of each transmission may be omitted, provided that the dates and times of commencing and terminating such mobile operation are entered in the log."

As amended, Section 12.136*(a)* reads as follows:

§12.136 Logs

* * * * *

(a) The date and time of each transmission, except that for a period of continuous mobile operation the time of each transmission may be omitted, provided that the dates and times of commencing and terminating such mobile operation are entered in the log. (The date need only be entered once for each day's operation. The expression "time of each transmission" means the time of making a call and need not be repeated during the sequence of communication which immediately follows; however, an entry shall be made in the log when signing off so as to show the period during which communication was carried on.)

Hammarlund's "DXpedition of the Month"

The Hammarlund Mfg. Co. has announced the creation of a "DXpedition of the Month" to begin approximately May 1st. Calls expected to be used are VR1N, VK9BH and VR4CB. Operation is expected to be on all bands including 160. A recent *CQ* author, VK3AHO will probably be handling the Pacific operations. *All* cards, including s.w.l.s will be confirmed. I.R.C.s and s.a.s.e. will *not* be required. Inquiries, information and cards will be handled through:

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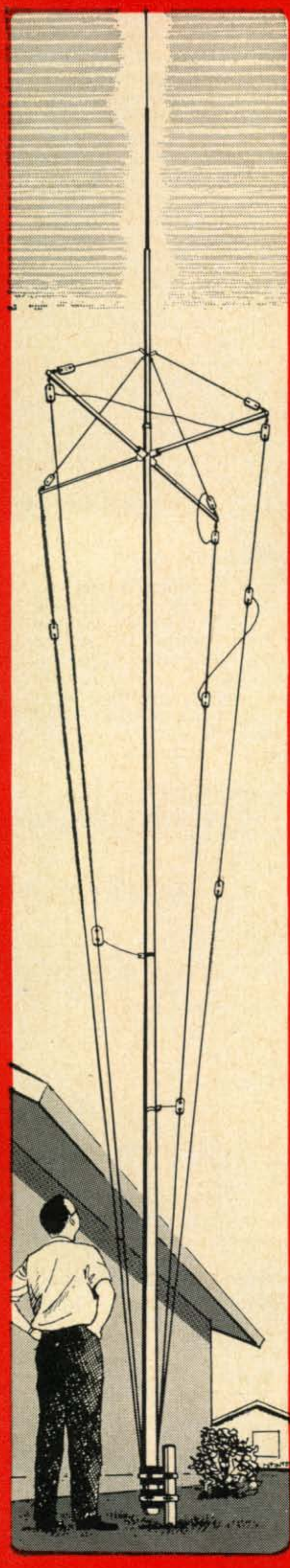
Foundation For Amateur Radio, Inc.

The Foundation for Amateur Radio, Inc. with headquarters in Washington, D.C., announces its intent to make the second award of the John Gore (W3PRL) Memorial Scholarship for either graduate or undergraduate study, full or part time. The scholarship pays $250 for the academic year, and is subject to renewal.

To be eligible, applicants must have completed one year in an accredited college or university and must be enrolled in a course of studies leading to a degree. They must also be radio amateurs holding a valid FCC license of at least a General class rating. Preference will be given to applicants from the area served by the Foundation—The District of Columbia, Maryland and Virginia, although those living elsewhere are *not* excluded.



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It all started the day Hy-Gain startled the industry by announcing the incomparable Hy-Tower—still acknowledged by experts as the epitome in vertical antenna systems. Now, today, for those thousands of Hams who requested it...Hy-Gain offers the new low-cost Hy-Tower Junior.

As its name would imply, the Hy-Tower Junior doesn't completely measure up to the Hy-Tower...probably nothing ever will. However, the Hy-Tower Junior is one sensational all band vertical in its own right. It's trapless—It has Hy-Gain's unique stub decoupling system for automatic band switching—It's lightweight (one man can install)—It's broad band (250 KC band pass on 75M)—It ground mounts on 1⅝" steel pipe—Its SWR is less than 2:1 at resonance on all bands—It's fed with 52 ohm coax—Its overall height is 36½ ft. phone; 38 ft. C.W.—It's modestly priced. All in all, the few Hams who have seen it say: It's the greatest advance in all band antennas since the Hy-Tower. See it today.

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Electrical Specifications:

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Maximum Power 1kw, AM; 2kw PEP
Polarization . . . . . Vertical
Pattern . . . . . Omni-Directional
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SWR . . Less than 2:1 at resonance
Band Pass . . 10-15-20-40M, below 2:1 SWR; 250kc below 2:1 75/80M
Multi-Band Technique . . . . . Stub Decoupling
Ground Plane Req. . Copper Plated 6' Ground Rod (not supplied)

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Overall Height . . . . . 36'6" Phone; 38' CW
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Available now from your favorite HY-GAIN distributor

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For further information, check number 55, on page 110

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For example—look at the picture below—from top to bottom the antenna consists of 4 elements wide spaced, 15 meters at 90 feet; 6 elements optimum spaced, 20 meters at 80 feet; 3 elements wide spaced, 40 meters at 71 feet. Note: ENTIRE TOWER ROTATES!!

The tower shown here is the Tri-Ex HZRN 71 foot tower which raises, lowers and rotates by remote control. The HZRN is available in 37, 54, and 71 foot heights. The HZN series, which does not have the rotating feature, is available in 37, 54, 71 and 88 foot heights.

Other Tri-Ex towers will support from the smallest to the largest antennas. There is a Tri-Ex tower ideally suited to your needs. Send for our new catalog.

FLASH! Next month Tri-Ex will announce your best buy in *free standing* towers! The new towers are priced *low* but support large antenna loads in hurricane winds!

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Requests for application should be made not later than May 20, 1963, and should be addressed to: Chairman of Scholarship Award Committee, FAR, Inc., 7605 Westfield Drive, Bethesda 14, Maryland.

The Foundation for Amateur Radio, Inc., is a non-profit organization devoted to the advancement of amateur radio. It is composed of trustees representing radio clubs in the Washington-Baltimore area.

Rome, N. Y. Ham Family Day

The Rome Radio Club is sponsoring its annual Ham Family Day, June 2nd. Door prizes, steak dinner and many other programs included. K2FF will talk on Silicon Rectifiers in Power Supplies. Reservations may be obtained from the club via P. O. Box 721.

Odessa, Texas

The Permian Basin A.R.C. also has its annual Swapfest set for June 2nd. A Drake TR-3 is pre-registration prize. W5NGX will fill you in on tickets and directions. His QTH is P. O. Box 1406, Odessa.

Monroe, Louisiana

Bernstein Park, Monroe, La. is the place and May 26th is the date. The Ouachita Valley A.R.C.'s annual Hamfest is the event. K5FMK is the chairman and you can obtain info on the event from 1101 Cole Ave., Monroe.

N. Y.—Pennsylvania

The combined efforts of the Southern Tier of New York State, Northern Pennsylvania Radio Clubs and the same area Amateur Radio Emergency Corps are sponsoring the fourth annual dinner and get-together on Saturday, June 1, at 6:30 P.M. The meeting place is St. John's Memorial Hall, Johnson City, New York. All proceeds will be used to maintain and operate AREC in this area. March 25, 1963 is the deadline for tickets, reservations, and prize contributions. K2ZRO is handling information. He's at 3609 Lott St., Endwell, N. Y.

Atlanta, Ga.

The Atlanta Radio Club will hold its 35th Annual Hamfest on Sunday June 2. It will be held in the auditorium of the Lenox Square Shopping Center. For tickets, contact W4HEG, 1606 May Avenue, S. E., Atlanta 16, Georgia.

More Buys

Bob Zuelsdorf, W9MUM tells us that since the article, "VHF Transistor Bargains" appeared in the February issue, five excellent "buys" have been made available: 2N696, $1.97; 2N697, $2.06; 2N706, $1.57; 2N708, $2.81 and the 2N2270 for $3.71. Add these to page 45 of *CQ* for February.

California

The San Fernando Valley Radio Club will hold its seventh annual Radio Show at the Glen-Aire Country Club, 3910 Stansbury Ave., Sherman Oaks, California on June 2. Registration $1.00 and $.50 for children under 12. Big attendance expected. Contact Skip Holt, WA6HXK, for more details.

Kansas

Neosho Valley Amateur Radio Club (Emporia) Hamfest will be held Sunday, May 5, at Blue Stem Hall, west of Emporia. Covered-dish picnic at noon. Registration $.50. For further info contact WØZGB, 420 Neosho, Emporia, Kansas.

Mexico

For those of you who can break away for a little trip, you're invited to the Liga Mexicana De Radio Experimentadores' 31st Annual Convention to be held at the San Louis Potosí on May 23-25. It is expected, among other interesting programs, that special licensing permits will be granted U. S. amateurs who attend the convention. Tony Pita, XE1CCP, vice-president of the League will answer any questions you may have about the show. His address is Sinaloa 9-5o Piso, Mexico 7, D.F.

◀ For further information, check number 31, on page 110

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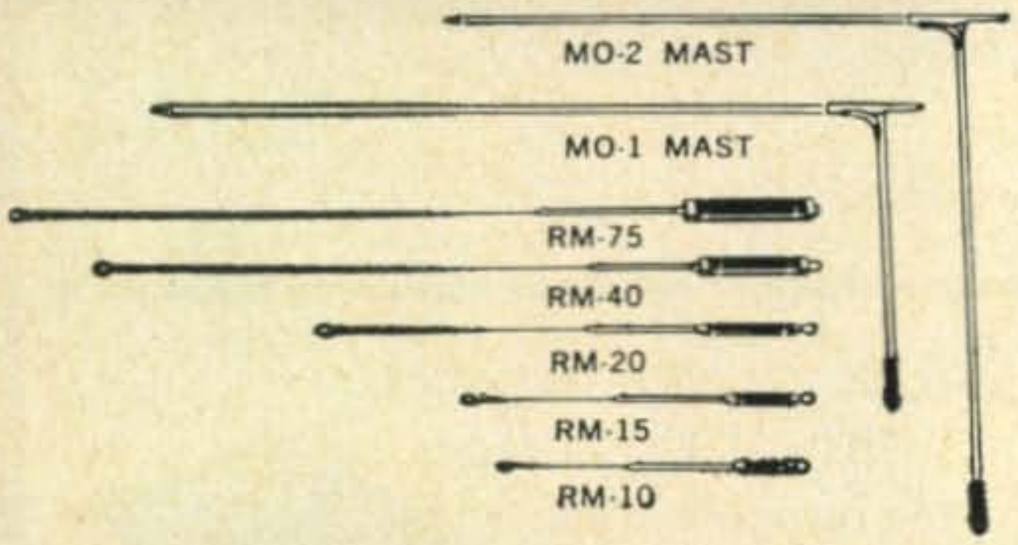
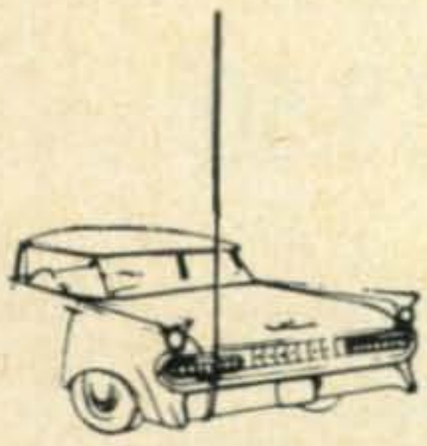
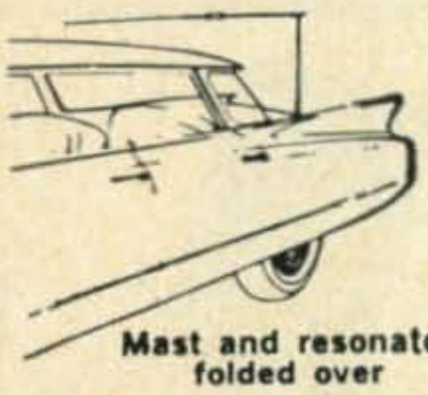
MOBILE ANTENNA
10-15-20-40-75- METERS



Buy only the mast and resonators for the bands you operate. NO NEED FOR MATCHING DEVICES, NO FEED LINE LENGTH PROBLEMS. Use any length of 52 ohm cable. New, efficient concept of center loading. Each resonator has a coil specially designed for maximum radiation for a particular band. Center frequency tuning is by an adjustable stainless rod in the resonator. The fold-over aluminum mast permits instant interchange of resonators. Mast folds over for garage storage. Mast has 3/8-24 base stud to fit standard mobile mounts, but will perform better with New - Tronic mounts. Power rating is 75 watts dc input A.M. - 250 watts PEP input for SSB.



Mast and resonator in mobiling position



Mast and resonator folded over

RESONATOR WILL WORK PROPERLY ONLY IF USED WITH MO-1 OR MO-2 MASTS. ANTENNA ASSEMBLY CONSISTS OF 1 MAST and 1 RESONATOR.

MODEL	DESCRIPTION	TOT. HGT. of ASSY.	NET
MO- 1	54" mast folds at 15" fr. base	Rear deck or fender	$ 7.95
MO- 2	54" mast folds at 27" fr. base	Bumper	7.95
RM-10	10 meter resonator	80" max. - 75" min.	5.95
RM-15	15 meter resonator	81" max. - 76" min.	6.95
RM-20	20 meter resonator	83" max. - 78" min.	7.95
RM-40	40 meter resonator	92" max. - 87" min.	9.95
RM-75	75 meter resonator	97" max. - 91" min.	11.95

ANY MAST OR RESONATOR MAY BE PURCHASED SEPARATELY

Ask your distributor to show you these and other fine NEW-TRONICS products. Write for literature on the complete NEW-TRONICS line.

NEW-TRONICS CORP.
3455 Vega Avenue **Cleveland 13, Ohio**

For further information, check number 29, on page 110

Starved Rock R. C.

The Starved Rock R. C. will hold their big outdoor Hamfest on Sunday, June 2nd at the LaSalle County picnic area southwest of Ottawa, Illinois. Pre-registration for the whole day is available at $1.50 until May 25. For additional info contact W9QLZ, RFD 1, Box 171, Oglesby, Ill.

Kansas City, Mo.

The annual WØ-DXCC dinner is being hosted this year by the Kansas City DX Club and will take place in the President Hotel on May 11. Registration fee of $6.75, which includes dinner, should be sent to KØOYQ, 5920 Nall, Mission, Kansas.

Bremerton, Washington

The Amateur Radio Association of Bremerton, Washington, will hold its annual hamfest and banquet (family style fried chicken) on Saturday, May 18, at the Sons of Norway Hall. Registration opens at 1300, dinner at 1900. Registration prior to May 10, $4.50 per person, $5.00 after that date and at the door. For reservations and further information contact Harry W. Jackson W7MCW, Route 5, Box 809, Bremerton.

DeKalb, Illinois

The Kishwaukee Radio Club will hold a Swapfest at the Hopkins Park Shelter House, DeKalb, Illinois, on Sunday, May 5th, from 10 A.M. to 4 P.M. A $1 admission donation will be accepted. No commission or other charges will be made for equipment sold, bought, or swapped. For more details, write Al Brand, 415 E. Sycamore St., Sycamore, Ill.

Pittsburgh

The Breeze Shooters, Inc. will hold its ninth annual hamfest at the Wildwood Lodge—just off Route 8 near Pittsburgh, Pa. on May 26. K3HSE will fill you in on the choice bits.

Western Illinois

The Western Illinois Radio Club hamfest will be held May 26 at Eagle's Alp, 5th St., Quincy, Ill., starting at 10 A.M. For tickets contact Commander Richard Phares, 708 So. 22 St., Quincy, Ill. Price: $2.00, at gate $2.50.

Pasadena Rose Parade

The South Bay Wireless Society, endorsed by the Los Angeles Council of Radio Clubs is working on the possibility of there being an amateur radio float in the Pasadena Rose Parade next January 1st. Here is a great chance for favorable publicity for amateur radio, but it will cost money (some $5000.), and your donation is solicited. Please send contributions to Amateur Radio Rose Parade Committee, Box R, San Gabriel, Calif. Please send check or money order, or cash by registered mail. Be sure to include your name and address, if the project falls through, your money will be returned. But, the committee needs to hear from you *now*, so it will know whether to go ahead with the project. Committee chairman is Kay Koch, K6HIT.

California VHF Jamboree

The first annual Southern California VHF Jamboree, will be sponsored by the Microwave Society of Long Beach, Inc., to be held at the Lafayette Hotel, in Long Beach, California, on June 14-16. Technical talks will cover a wide variety of v.h.f., u.h.f. and microwave topics including antenna systems, transmitters, converters, transistors and diodes. Pre-registration including the banquet, before May 15th, is $5.50 per person or $6.00 at the door. Pre-registration for general admission only, before May 15th, is $2.00 and $2.50 at the door. Make all checks payable to the Microwave Society of Long Beach, Inc.; QTH P. O. Box 3303, Long Beach 3, California. Not included in the registration fee are meals which are priced at a nominal figure of $1.50 for breakfast, $2.00 for luncheon and $3.00 for supper.

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"The most talked about HAM RECEIVER"

2-B Receiver
$279.95
amateur net

2-BQ
Q-Multiplier/Speaker
$39.95 amateur net

For more information ask your distributor or write us for brochure with complete specifications and schematic.

The Drake 1-A Sideband Receiver was introduced in 1958. The 2-A with improvements for all modes followed in early 1960. The present Model 2-B with improved selectivity for SSB, CW and AM was announced in April 1961.

In this short time the Drake Receiver has become the most popular and talked about receiver on the ham bands. Whether you are a Novice or 60 wpm operator, a beginner AM or experienced SSB'er you will discover the 2-B has been engineered for all your receiver needs.

Just ask the ham who owns one.

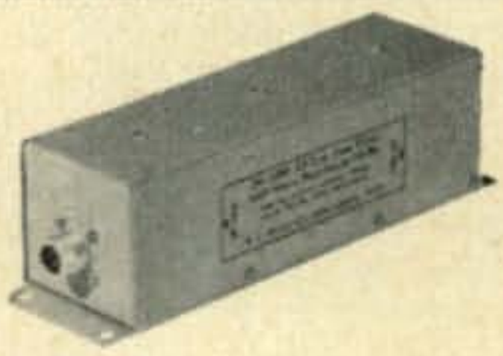
R. L. DRAKE COMPANY • Miamisburg, Ohio

For further information, check number 35, on page 110

TVI CAN BE ELIMINATED WITH DRAKE FILTERS

The Drake Amateur Low Pass Filters

have four Pi Sections designed for sharp cut-off between 6 meters and channel 2 and to attenuate all transmitter harmonics falling in any TV channel and the FM band. 52-ohm impedance. Low insertion loss.



TV-1000-LP rated 1000 watts input, 200 watts on 6 meters. SO-239 connectors built-in.
$16.95 amateur net

TV-100-LP rated 100 watts input, 20 watts on 6. Solder it in or use your own SO-239 connectors.
$5.95 amateur net

THE DRAKE TV-300-HP

. . . peer of high pass filters, provides more than 40 db attenuation at 52 MC and lower. Protects the TV set from all amateur transmitters 6 thru 160 meters. Three models—TV-300-HP 300-ohm, TV-72-HP 72-ohm, TV-300-HP(RCA) 300-ohm plug-in for RCA sets.
Any model $3.97 amateur net

The Drake TV-CB-LP Citizen Band Low Pass

is a four section filter designed with 43.2 MC cut-off and extremely high attenuation in all TV channels for citizen band and other transmitters 30 MC and lower. Rated 100 watts input. SO-239 connectors built-in.
$6.95 amateur net

$2.55 amateur net

TV-300-FMT 88 to 108 MC Band Rejection Filter.

FM broadcast transmitters are responsible for considerable TV interference being blamed on radio amateurs. The problem has become quite serious due to recent increase in the number and the power of FM broadcast stations. Overload problems and beats between FM and TV stations in TV front ends cause breakup in color pixs and wavy lines in black and white. The Drake TV-300-FMT installed in TV antenna lead and adjusted to frequency of interfering FM station will clear up pix.

SEE YOUR DISTRIBUTOR FOR DRAKE FILTERS

For details about TVI, write for free brochure

R. L. DRAKE COMPANY • Miamisburg, Ohio

For further information, check number 36, on page 110

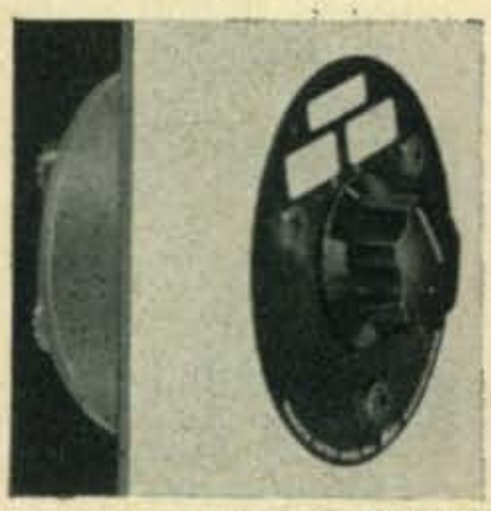
WATERS

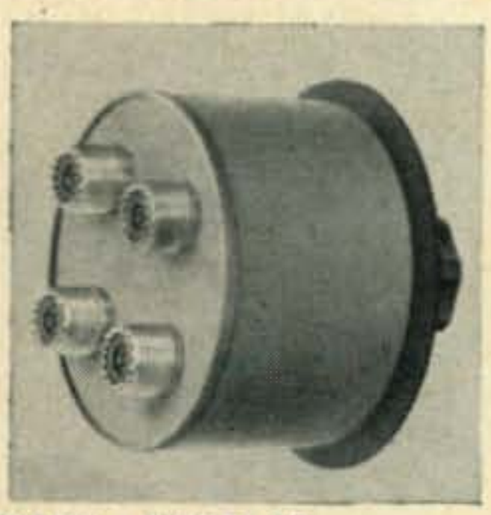
COAXIAL SWITCHES

Designed for panel mounting, and featuring in-line orientation of the coaxial connectors, these compact units occupy a minimum amount of space with ready access for connecting and disconnecting. The Waters Coaxial Switches have a negligible insertion loss, low standing-wave ratios (less than 1.1 up to 150 mc.), and a power carrying capacity of 1 kw. They come in two models complete with mounting screws, knob, and escutcheon plate with provision for erasable markings.

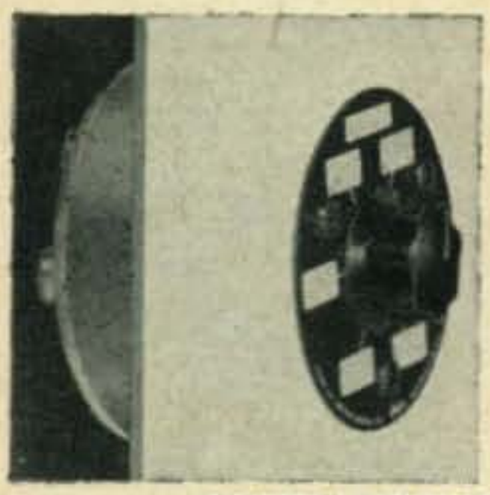
COAXIAL TRANSFER SWITCH — MODEL 336. A double-pole, double-throw (internally strapped) unit for in-and-out switching of a Power Amplifier between an exciter and antenna. Connections are made to 4 standard SO-239 UHF connectors. Amateur Net: $11.45

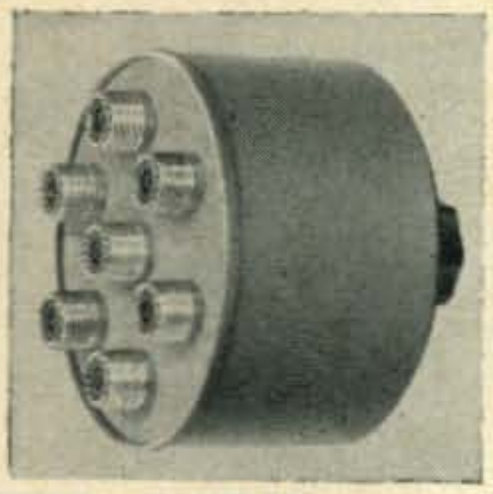
COAXIAL SELECTOR SWITCH — MODEL 335. A single-pole, 6-position switch used for selection of RF sources, antennas, etc. Connections are made to 7 standard SO-239 UHF connectors. Amateur Net: $12.95 . . . . . Available at leading distributors





COAXIAL TRANSFER SWITCH — MODEL 336





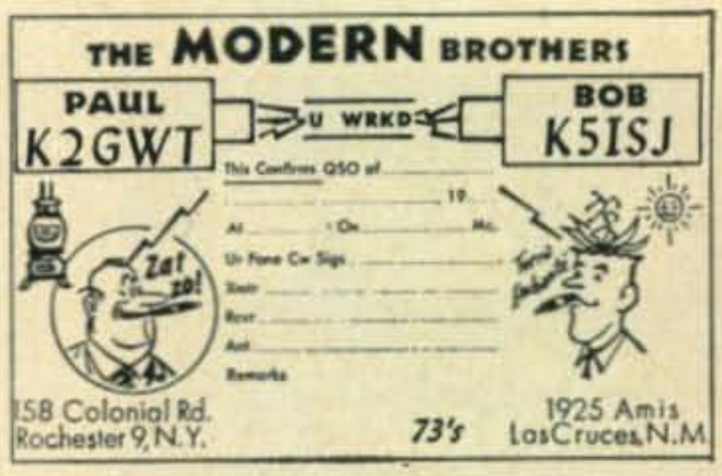
COAXIAL SELECTOR SWITCH — MODEL 335

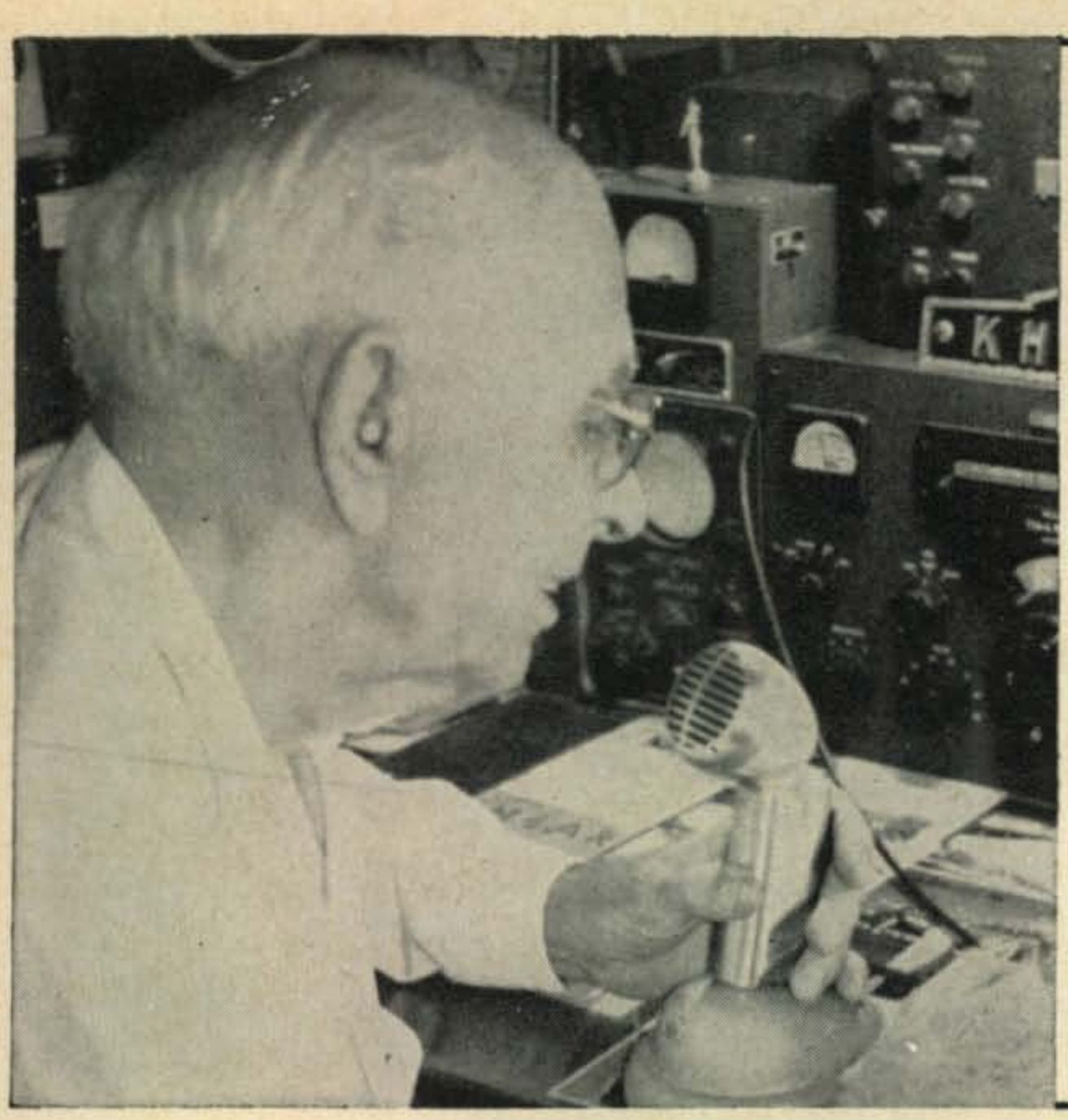
WATERS MANUFACTURING, INC.
WAYLAND, MASSACHUSETTS

For further information, check number 30, on page 110

QSL contest

THE QSL contest this month is a bit different in that all the cards illustrated show two calls! The winner, WA5EAD/WA5EDC is from an OM/XYL team as is that from K2ZCD/K2ZCE. K2GWT/K5ISJ is a brother combination and W8CX/K4URA tells of his winter retreat in Leesburg, Florida. We're now collecting cards with *three* calls; any takers?





KH6AR
Wahiawa, Oahu, Hawaii
reports:

"most natural sounding SSB mike yet"

We'll let Ken Bryan's (KH6AR) letter to us speak for itself:

"I've been using my Shure 440SL on regular skeds with people who know my voice from eyeball QSO. That includes my daughter who doesn't ordinarily like the tone of sideband. Everybody tells me that it's the most natural sounding SSB mike yet . . . especially my daughter.

"The pick-up is great. The tendency of local splatter and unwanted sideband is *considerably* reduced over three other mikes I compared it with. Humidity doesn't affect it at all. All in all, I feel it's the best SSB mike I've ever had, including one that cost me over $50.00!"

ONLY **$28.50** net

(complete with stand, grip-to-talk switch, 7 ft. highest quality 2 conductor shielded cable.)

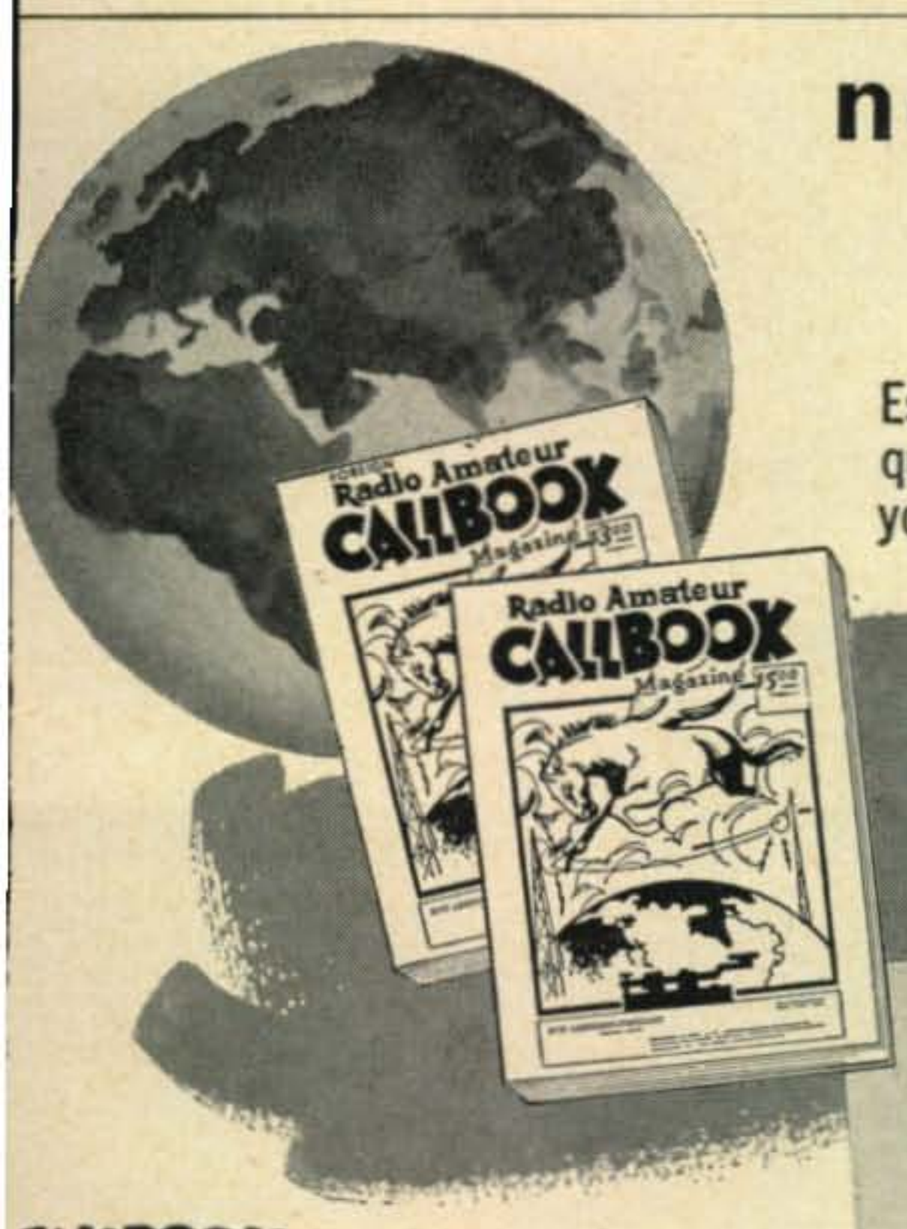
A87K Modification Kit. *Instant switching from VOX (with muted microphone position) to push-to-talk. $3.25 net.*

SHURE **440SL**

CONTROLLED MAGNETIC SSB, AM, FM MICROPHONE

Literature: Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Illinois

For further information, check number 37, on page 110



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RADIO AMATEUR CALLBOOK

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SSB problems solved here

Amperex status as the source of more tube types for Single Sideband Suppressed Carrier Service than any other producer didn't just happen. Leadership has been achieved as the result of a deliberate and continuing program of engineering research and intensive laboratory testing from which has emerged a distinctive and clearly superior comprehension of SSB technology and SSB applications for any power level from 5 watts to 5 kilowatts PEP.

From internal tube geometry to overall envelope design, AMPEREX SSB Tubes are *Performance Tested, Performance Rated* and *Performance Guaranteed* for optimum linearity and minimum intermodulation distortion *at full Single Sideband power ratings.*

Ask Amperex

like this...

SSB TYPE NO.	8179	6156	8117	7527	6079	6155
Peak Envelope Plate Power Output *(watts)*	1410	421	158	723	1032	206
3rd Order Intermodulation Distortion *(db)* (without feedback)	34	35	30	35	35	30
5th Order Intermodulation Distortion *(db)* (without feedback)	40	40	40	40	40	38

Illustrated are six radiation air-cooled tetrodes of a line of more than 20 AMPEREX "Performance-Rated" SSB tubes with power ratings from 5 W. to 5 Kw. PEP. Watch for releases of new SSB tubes now in prototype stage. Write for technical data sheets. Applications engineering assistance available. AMPEREX Electronic Corporation, Tube Division, Hicksville, L.I., N.Y.

IN CANADA: PHILIPS ELECTRON DEVICES, LTD., TORONTO 17, ONTARIO

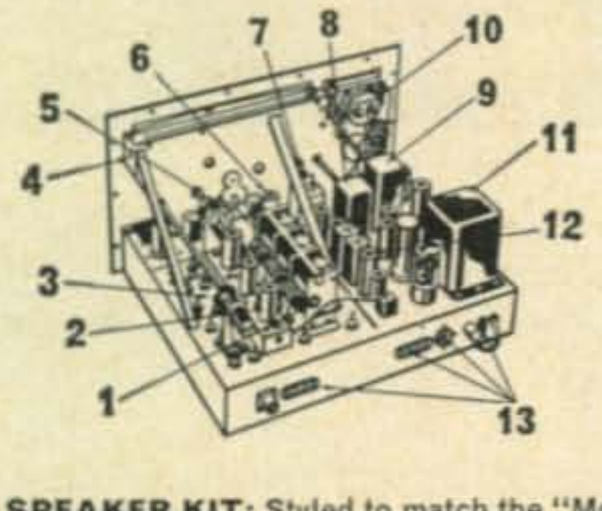
For further information, check number 51, on page 110

all modes...

HEATHKIT "MOHAWK" DELUXE AMATEUR RECEIVER

1. Amateur band coverage only for maximum accuracy and stability. **2.** 1 uv sensitivity for 10 db S/N ratio—160 through 10 meters. **3.** Prebuilt, prealigned coil/bandswitch assembly. **4.** Rotating slide-rule dial. **5.** 15 tube double conversion superheterodyne receiver. **6.** Upper and lower sideband selection (crystal controlled). **7.** 5 selectivity positions (5 kc to 0.5 kc). **8.** Bridged T-notch filter. **9.** Stable, variable BFO. **10.** Panel "S" meter. **11.** Rugged well-rated components used throughout. **12.** Built-in 100 kc crystal calibrator. **13.** Terminals for antenna (50 or 300Ω), speaker (8 or 500Ω), accessories (B+, fil. muting), 117 V AC.

Kit RX-1..69 lbs...no money down, $28 mo.....**$299.95**



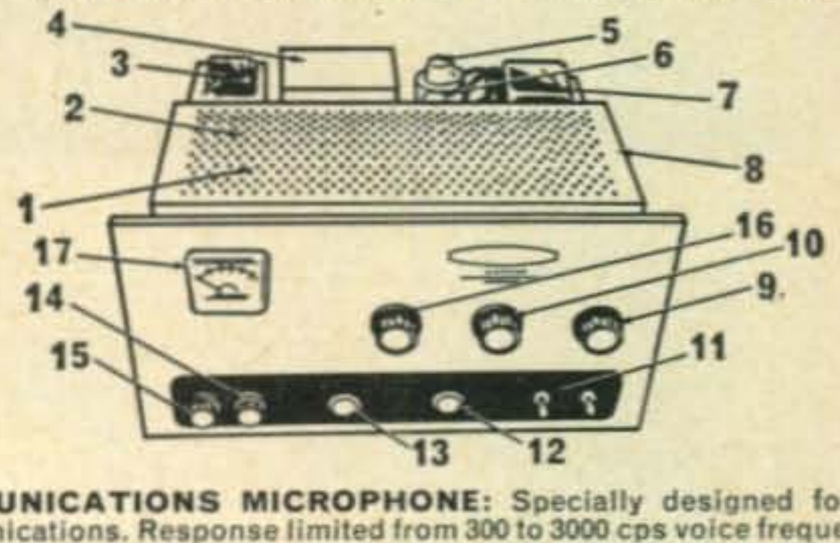
ACCESSORY SPEAKER KIT: Styled to match the "Mohawk". Heavy-duty 8" PM speaker. 8 ohms impedance. 4.7 oz. magnet. 7 lbs.

Kit AK-5.....**$10.95**

HEATHKIT "WARRIOR" DESK-TOP KILOWATT LINEAR AMPLIFIER...OPERATES SSB, AM & CW—80 THROUGH 10

1. Four 811A's **2.** Fan cooling **3.** 5-50 hy. swinging choke **4.** 8 ufd, 2 KV, oil-filled filter capacitor **5.** Two 866A's **6.** Monitor scope output with level control **7.** 1500 v. Power transformer **8.** Internal RF shielding **9.** Loading control **10.** Band switch, 80 through 10 meters **11.** Power and High Voltage interlocked switches **12.** High Voltage pilot light **13.** Power pilot light **14.** Relative Power sensitivity control **15.** Meter switch with Grid, Plate, Relative Power, and High Voltage positions **16.** Tuning control with band markings **17.** Meter

Kit HA-10..101 lbs...no money down, $22 mo....**$229.95**



COMMUNICATIONS MICROPHONE: Specially designed for SSB communications. Response limited from 300 to 3000 cps voice frequencies. Stand has grip-to-talk switch with lock position. Hi-Z output. 3 lbs.

HDP-21....no money down, $5 mo.....**$29.40**

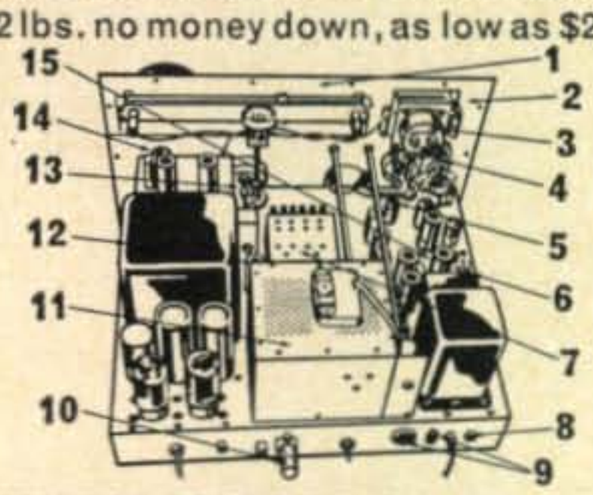
all HEATHKITS

choose from the widest selection at the lowest prices . . . choose quality engineered Heathkits!

HEATHKIT "MARAUDER" SSB TRANSMITTER.. UNMATCHED AT LESS THAN TWICE ITS PRICE!

1. Operates SSB (upper or lower sideband), CW, AM and FSK. **2.** 180 watts P. E. P. on SSB and CW—80 through 10. **3.** Panel meter (grid, plate, HV, ALC, Rel. Pwr). **4.** VOX controlled break-in CW operation. **5.** Automatic level control for higher talk power. **6.** Multi-section, hermetically sealed crystal band-pass filter. **7.** Dual conversion, crystal controlled heterodyne oscillator. **8.** FSK input. **9.** Accessory sockets. **10.** Monitor scope output. **11.** Air-cooled, shielded final amplifier. **12.** Heavy-duty power supply. **13.** 165 to 1 gear drive tuning assembly. **14.** Preheated, temperature compensated VFO—100 cps stability. **15.** Carrier suppression, 50 db; unwanted sideband suppression, 55 db.

Kit HX-10 92 lbs. no money down, as low as $22 mo. **$334.95**



HEATHKIT MONITOR SCOPE KIT: Specially designed for Amateur Radio use! Shows SSB/AM envelope, RF trapezoid and RTTY patterns. Handles 5 watts to 1 KW, 160 through 6 meters. 11 lbs.

Kit HO-10....no money down, $6 mo.....**$59.95**

FREE 1963 CATALOG Fully illustrates over 250 different quality kits at money-saving do-it-yourself prices! Choose from a complete selection of Amateur Radio "Mobile" and "Fixed" station gear and Accessories. Whatever your need you'll find a Heathkit to fill it! Send for your free copy today!

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For further information, check number 14, on page 110

A Broad-Band Nuvistor Preamplifier

MARTIN L. KAISER*, W2VCG

Here is a low noise, 3 nuvistor cascode r.f. preamplifier. It provides a gain of 20 db from 3 to 30 mc and may help the best of receivers.

THIS r.f. amplifier must be heard to be believed. The unit provides a minimum gain of 20 db from 3 to 30 megacycles. The graph showing amplification as a function of frequency, shown in fig. 1, will give you an idea of the performance that may be expected.

It can be built for approximately $15 if all new components are used, and less if you have a well stocked junkbox. A simple accessible layout makes construction easy and available commercially wound coils greatly reduce the chore of coil winding.

One note of caution—this unit can *not* be used with transceivers unless a special switching arrangement is employed to prevent the transmitter output from passing through the amplifier.

How The Amplifier Works

As shown in fig. 2, the input signal is coupled to the grid of V_1 through high-frequency coils L_1 and L_{1a} and to the grid of V_2 through the low-frequency coils L_2 and L_{2a}. Coupling between each of the input-coil combinations is both inductive and capacitive and thus, provides the proper bandwidth, balance, and phase response. The circuit has no ground return on coils L_{1a} or L_{2a}. The amplified signals from V_1 and V_2 are

*418 Hale Street, Pennington, N.J.

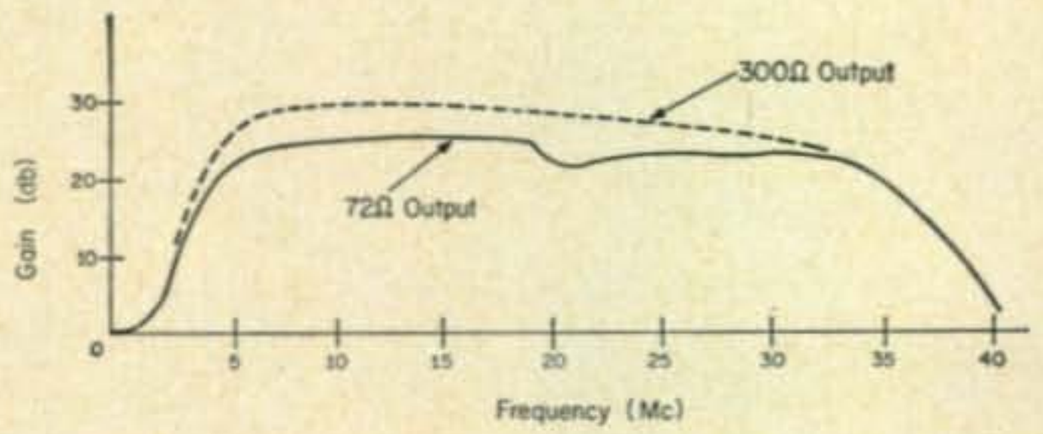
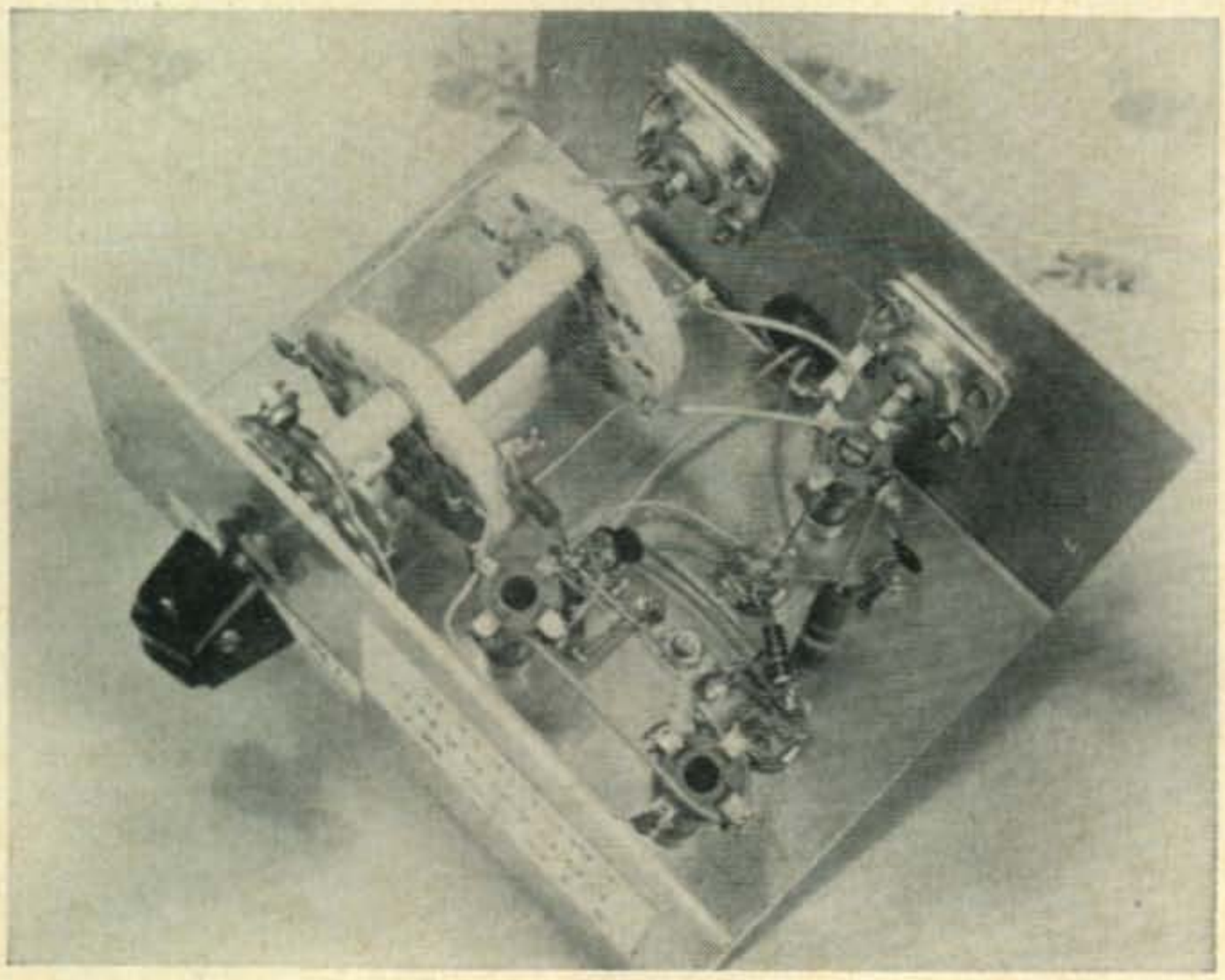


Fig. 1—Plot of gain vs frequency. Coil L_2 covers up to 22 mc and L_1 covers from 15 to 40 mc. To peak the center, L_3 is tuned to 20 mc to cover from 15 to about 23 mc.

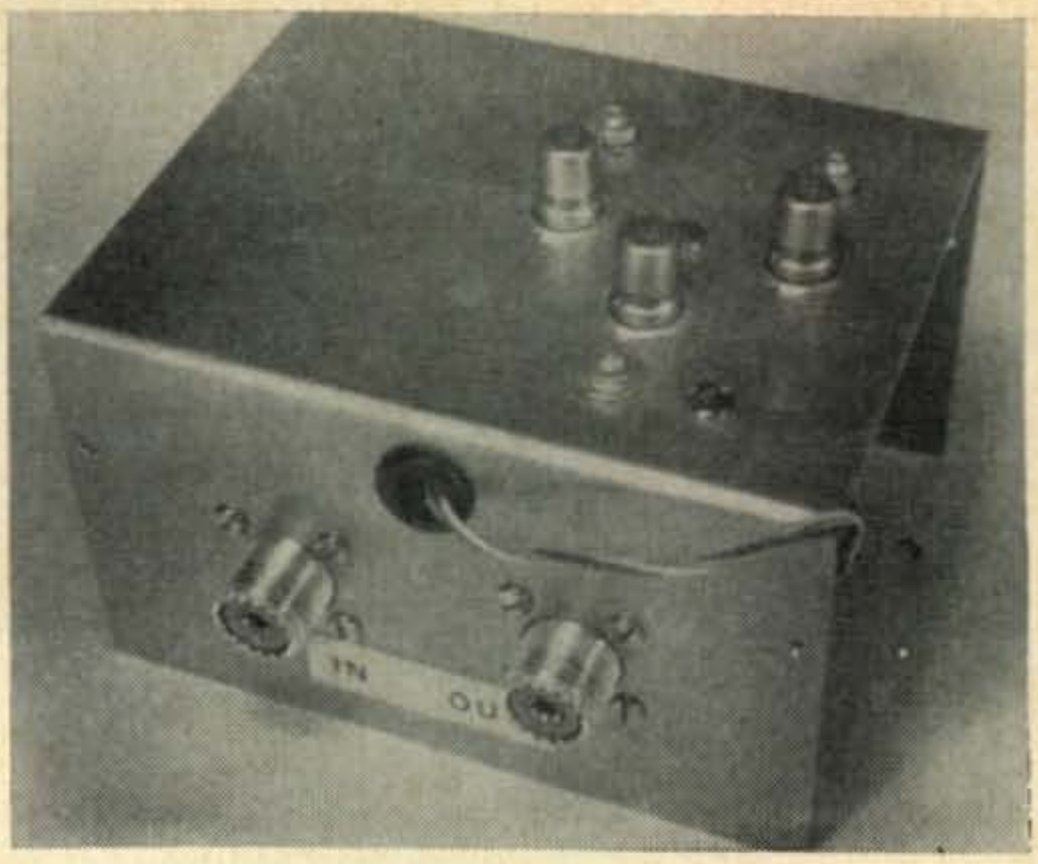
mixed through a common plate connection and are d.c. coupled to the cathode of V_3. Coil L_3 was added to flatten the response curve at about 20 megacycles.

Construction

The 3 × 4 × 5 inch amplifier chassis shown in the photo allows ample working space for even the inexperienced constructor. Mounting and wiring of components should follow the layout closely for optimum performance of the amplifier. Because the coils are critical for proper results, their construction is discussed in detail. North Hills coils are specifically recommended and should be completed before they are



Bottom view shows the neat and simple wiring. Note the slug of L_3 set flush with the bottom of the form. The only front panel control is S_1, the bypass switch.



This three-quarter view of the preamplifier shows the 3 nuvistors. The rear left is V_1, rear right V_2. The input, output and power leads are on the rear flange.

mounted on the chassis.

Inspect the winding of L_1 and note its winding direction. Coil L_{1a} is wound by removing the enamel from one end of a 20 in. piece of 30 enamelled wire, soldering the bared end to one of the two unused coil lugs, and adding 18 turns in the same direction as the original winding, starting at the base end of the coil form. From the top of the winding, run the wire down to the other unused lug on the coil form, cut the wire, clean off the enamel and solder the end to the remaining lug. Then spray the coil with Krylon so that the winding will not come loose. The winding of coil L_{2a} follows the same general procedure except that it requires 34 turns of a 40 inch piece of #30 wire. Similarly, coil L_{3a} requires 7 turns of a 10 inch length of #30 wire.

Remove the tuning slug from L_1 and L_2. The tuning slug in coil L_3 is turned in until it is flush with the bottom of the coil form.

Mount the coils on the chassis and proceed with the wiring as shown in fig. 2. All leads should be kept short.

Operation

A power supply of 6.3 volts a.c. at 0.4 amperes and 140 to 160 volts d.c. at 20 milliamperes is connected to the amplifier. This power usually is available from an accessory socket in the communication receiver. Should your receiver have no accessory socket, a schematic for a power supply is shown in fig. 3.

For proper operation, the antenna system must present less than 100 ohms impedance to the amplifier input. A 72 ohm antenna cut for the desired band or a 72 ohm multiband antenna is ideal.

Output is fed through a 72 or 300 ohm lead to the receiver depending on the wiring arrangement used. As shown in fig. 1, a 300 ohm output adds an average of 6 db across the entire band. For 300 ohm operation unground L_{3a} and modify the switching circuit for 2 wires.

To the best of the author's knowledge, no other r.f. amplifier in this price range can equal the broadband performance of this unit. ■

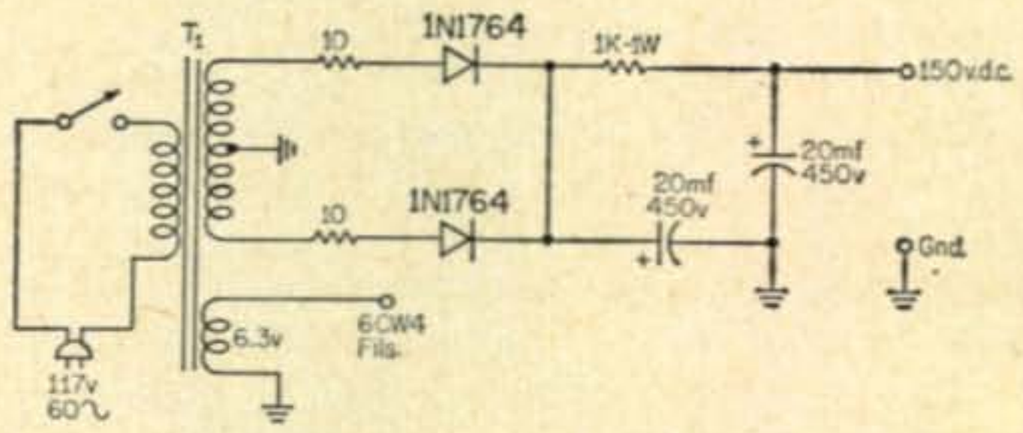


Fig. 3—This simple power supply may be used if power is not available from the accessory socket. Transformer T_1 is a Stancer PS8416 or equal.

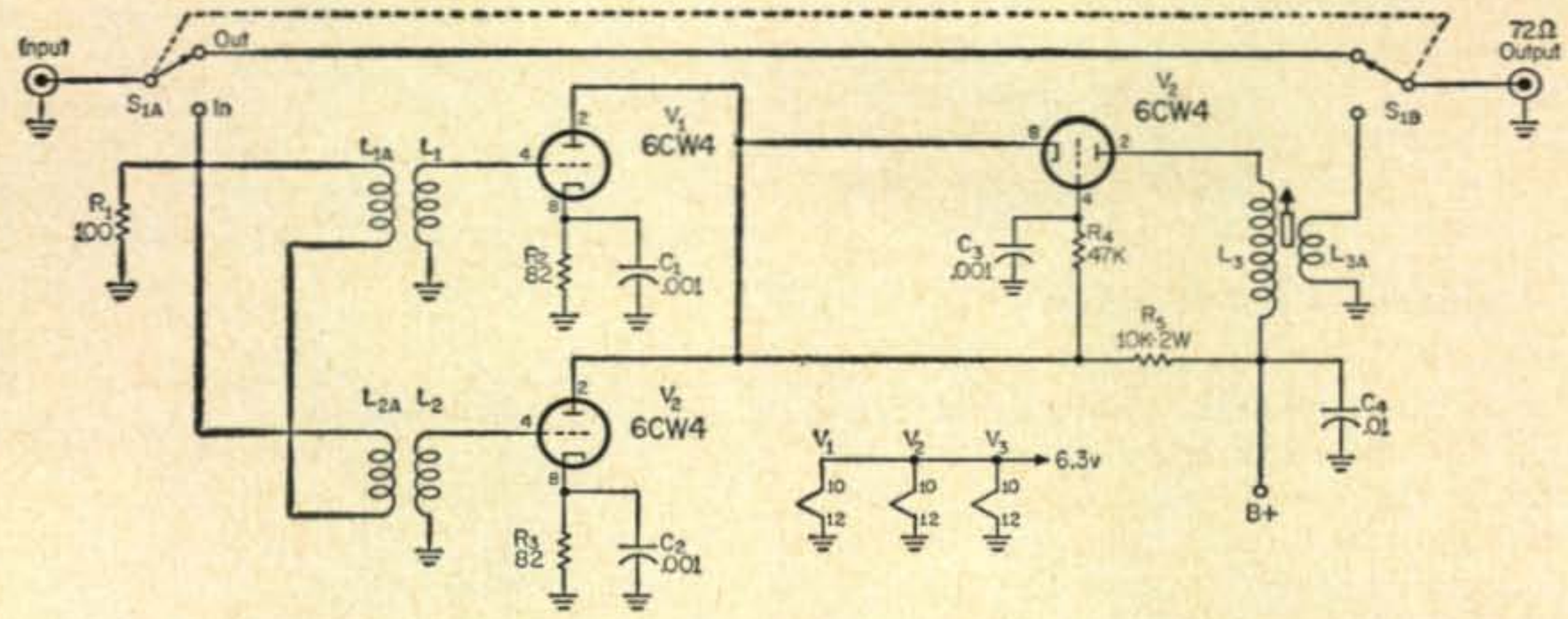


Fig. 2—Circuit of a 3 nuvistor broadband r.f. amplifier. All capacitors are in mf and are disc ceramics. All resistors are ½ watt unless otherwise noted.

L_1—North Hills 102C with core removed.
L_{1a}—18t #30 E. closewound on L_1.
L_2—North Hills 102F with core removed.
L_{2a}—34t #30 E. closewound on L_2.
L_3—North Hills 120E.
L_{3a}—7t #30 E. closewound on L_3.
S_{1a}, S_{1b}—Centralab wafers, XXD.

An Invitation:

Armed Forces Day, May 18

THE Department of the Army, Navy, and Air Force are appreciative of the technical skills and operating proficiencies of the Amateur Radio Fraternity. The Amateurs contributions to communications training, international good will, military morale and recreation, and emergency services are recognized by every echelon of the military services.

In appreciation of the United States Amateur Radio Operator's loyalty and patriotism, the Army, Navy and Air Force annually sponsor a military-amateur radio communication program on Armed Forces Day. Planned and implemented by the Director, Naval Communications and the Chiefs of the Army and Air Force Military Affiliate Radio System (MARS) for their respective services, the Armed Forces Day program will be held this year on Saturday, 18 May 1963. On this fourteenth observance of Armed Forces Day all amateurs are invited to participate and demonstrate to the world the close partnership and mutual respect that the U.S. amateurs and U.S. Military enjoy.

The program this year will include a west coast station of each of the participating services in addition to the Washington, D.C. headquarters stations of previous years. This addition during the military-to-amateur contact phase will improve the receive capability of the military, and thereby provide the low power stations in the western states an opportunity to obtain the special awards which they have been unable to receive in prior years.

Each of the six military stations will offer a special one-time-only QSL Card for each confirmed contact with an amateur whose call appears in the *Callbook*.

Other awards will be special Certificates signed by the Secretary of Defense for perfect copy of the International Morse Code and Radioteletype receiving contests. The receiving contests are open to any amateur, short wave listener, or other individual who posseses the necessary skills to obtain a perfect copy.

Elements of the Program

A military-to-amateur transmitting and receiving test for licensed amateur radio operators: The military stations will transmit crossband on spot frequencies *outside* the amateur bands and establish radio contacts with amateurs *in* the appropriate sections of the amateur bands. This is a test of crossband operations, and contacts will consist of a brief exchange of locations and signal reports. No traffic handling will be permitted.

A c.w. receiving contest for any person capable of copying International Morse Code at 25 words per minute: The c.w. broadcast will consist of a special Armed Forces Day message from the Secretary of Defense addressed to all radio amateurs and other participants.

A radioteletypewriter (RTTY) receiving contest for any licensed amateur, individual or station that possesses the required equipment: This is a test of the operator's technical skill in aligning and adjusting his equipment, and serves to demonstrate the growing number of amateurs that are becoming skilled in this method of rapid communications. The RTTY broadcast will be transmitted at 60 words per minute and will consist of a special Armed Forces Day message from the Secretary of Defense to all Radioteletypewriter enthusiasts.

Operating Schedules

Each transmission for the c.w. and RTTY receiving contests will commence at the indicated times with a ten minute CQ and identification call to permit the participants to select their station and frequency and to make adjustments.

The ten minute CQ will be followed immediately by the appropriate competition instructions and the SECDEF message. The message will be transmitted by all stations simultaneously and one time *only*. It is not necessary to copy more than one station and no extra credit will be given for so doing.

Transcriptions should be submitted "as received." No attempt should be made to correct possible transmission errors.

Time, frequency and call of the station copied as well as the name, call sign (if any), and address of the individual submitting the entry should be indicated on the page containing the text. Each year there are a large number of perfect copies that do not receive the certificates because the above information was not submitted. The name and/or call sign of the individual are mandatory if the certificate is to be awarded.

Competition entries should be submitted to the Armed Forces Day Contest, Room 5B960, the Pentagon, Washington, D.C., and postmarked not later than 31 May 1963.

C.W. Receiving Contest

Time 18 May 1963	*Transmitting Station*	*Frequencies (Kc)*
190300 GMT (2300 EDST)	WAR/AIR (Wash., D.C.)	3347, 6992.5, 14405
190300 GMT	NSS (Wash., D.C.)	3385, 4015, 6970, 7301, 13992
190330 GMT	A6USA (Calif.)	6997.5
(1900 PST)	NPG (Calif.)	4005, 7301.5, 13975.5
	AG6AA (Calif.)	7832.5

RTTY Receiving Contest

Time	*Transmitting Station*	*Frequencies (Kc)*
190335 GMT (2335 EDST)	WAR	3347, 6992.5, 14405

[*Continued on page 86*]

Practical Design of a D.C. to D.C. Converter

BY CANTRELL SMITH*, K4JQG

PART I

This three part article on the design of d.c. to d.c. converters is written in a clear and concise manner which the average amateur will be able to follow easily. The mathematics involved is simple. Part one discusses the benefits of such a supply, the circuit, and theory of operation in the simplest of terms. Part two will cover design considerations including core size, wire size, turns, etc. Part three will describe the actual construction of the transformer, the heat sinks and design of the filter circuits for a practical unit.

THIS article will attempt to give a design procedure for transistorized power supplies which the average amateur can use to build equipment to meet his own requirements. The language and calculations will be as non-technical as possible for the benefit of those who are relatively new to the field of radio and electronics.

What are the advantages of transistorized power supplies? This type of supply has a theoretical efficiency of almost 100% and a very practical and easily obtained efficiency of over 80%. This makes it an excellent choice for mobile installations. The choice of operating frequencies for the multivibrator and small components give a compactness hard to obtain in any other type of supply. Finally, the lack of moving parts gives long life and trouble free operation. The life of a pair of power transistors, properly designed into a supply, can be rated in years.

Circuit Operation

Before the design of a supply is started, a practical transistorized unit will be discussed to see how and why it operates.

The power supply described here is a well-designed, efficient transistorized supply capable of delivering up to 70 watts to the high voltage load and 5 watts to the low voltage load. It was designed to power the General Electric Pacer Mobile Radio. However, its simplicity, compactness, and efficient performance make it ideal for amateur radio applications.

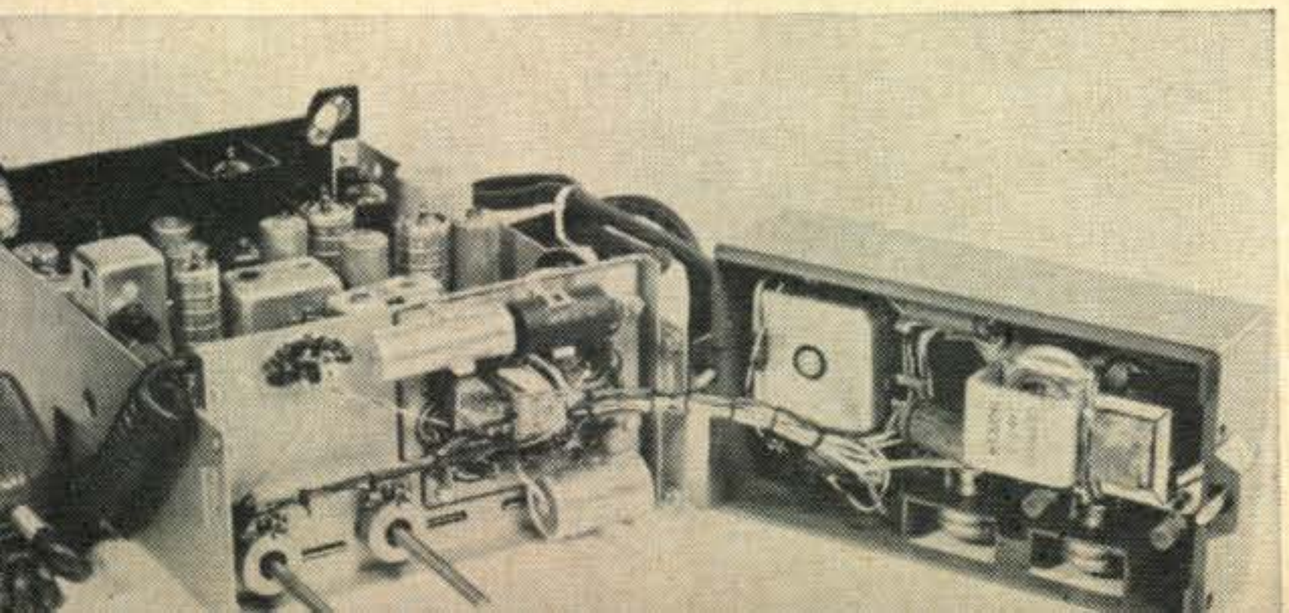
Basically, this supply is a multivibrator using a toroidal transformer and proper biasing networks for the transistors. The operating frequency is approximately 700 c.p.s. It has one unique feature which will be explained later.

First, a general idea will be presented of how the unit functions. Then the function of each individual component will be considered.

When switch S_1 (fig. 1) is closed, a current will flow from the negative terminal, point C, through the voltage divider R_2R_1 to B, then the positive terminal of the battery. This current flow causes point A to be negative with respect to point B, the emitters of the transistors. You will note that for d.c., point A is connected to the bases of Q_1 and Q_2. Therefore, the bases will be negative with respect to the emitters. This is the proper bias to make the transistors conduct. Due to manufacturing tolerances in the transistors and differences in circuit constants one of the transistors will start conducting before, or will conduct more than, the other. Which one starts first is not important. Assume that Q_1 starts conducting first and follow the action through a complete cycle.

When Q_1 starts to conduct a current will flow from point C through the upper half of the primary winding and through the Q_1 collector to emitter circuit to B, and the positive terminal of the battery. This will be a *changing* d.c. current, starting with a minimum and increasing to a certain maximum value. The changing d.c. current induces a voltage across the lower half of the primary and across the feedback winding. The induced voltage is of the proper polarity to increase conduction in Q_1 and prevent conduction in Q_2. In other words the base of Q_1 becomes more negative and the base of Q_2 swings positive with respect to the emitters. At the same time the collector of Q_2 is swinging in a negative direction with respect to the emitter. Transistor Q_1 continues to conduct with an increasing current until

* Technical Specialist, Communications Products Dept., The General Electric Company, Lynchburg, Virginia.



Inside view of the head of the G.E. Pacer transciever. The entire power supply (except the output filter) is mounted in the cast aluminum head which acts as the heat sink for the power transistors.

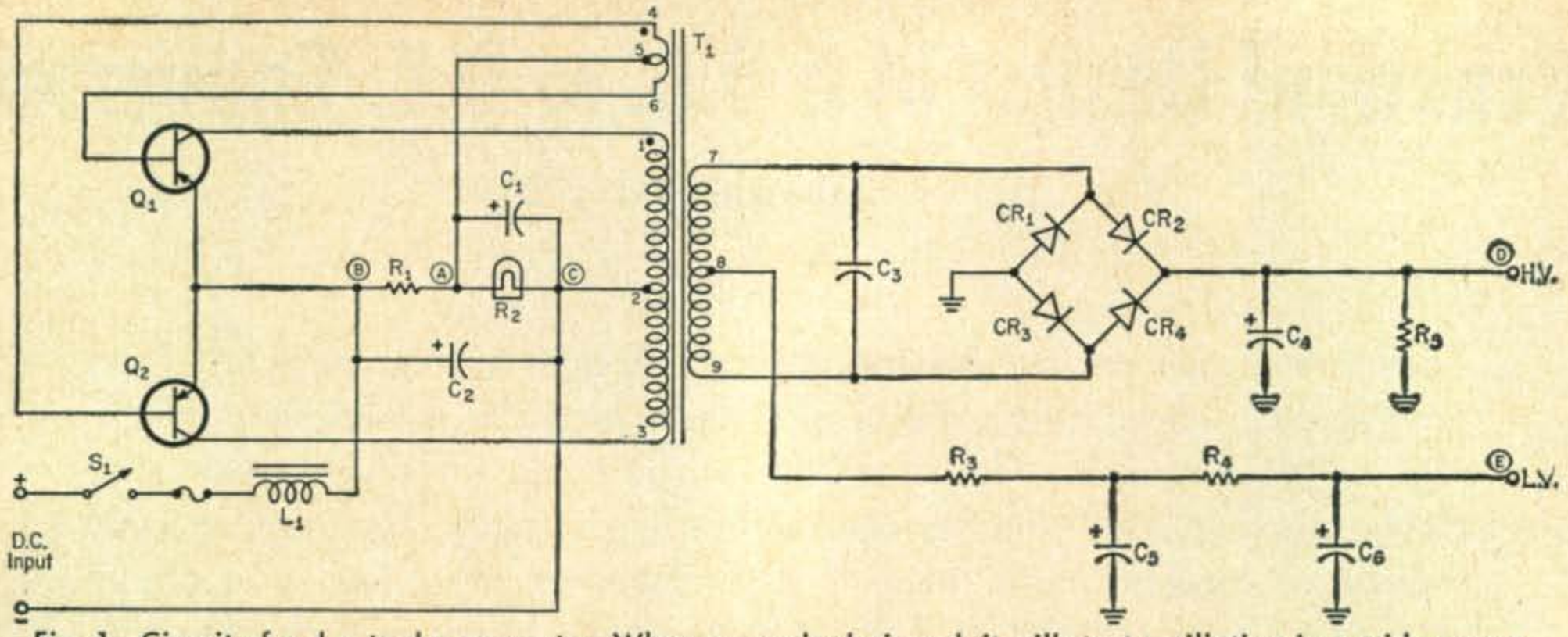


Fig. 1—Circuit of a d.c. to d.c. converter. When properly designed, it will start oscillating in a wide range of temperatures, from —50°C to 70°C and provide a high and low voltage output.

the core of the transformer saturates. At this point the flux ceases to change and the magnetic field starts to collapse. The collapsing magnetic field reverses the voltage polarities across all windings. This, of course, tends to stop conduction in Q_1 and start conduction in Q_2. The same series of events is now repeated in the Q_2 circuit and associated windings. The transistors will continue to switch back and forth as long as the voltage is applied to the input terminals. The a.c. output of the secondary is essentially a square wave.

Component Functions

Now we will look at the individual components of the power supply and see what part each plays in the operation of the unit. The transistors are 15 ampere units. Their principal function is to alternately switch the battery across the two halves of the primary. Components L_1 and C_2 form a filter to prevent switching transients from feeding back down the input leads and getting on the filament leads of the radio. This filter also prevents voltage transients in the ignition system from reaching the transistors and damaging them. Capacitor C_1 tends to suppress spikes that develop across the relatively high resistance of the pilot lamp, R_2.

Resistors R_1 and R_2 form a voltage divider across the battery and furnish the d.c. starting bias for the transistors. The ratio of R_2 to R_1 is very important to the operation of the supply. The voltage developed across R_1 is applied to the base-emitter junction of the transistors to bias them on, and should be just sufficient for consistent starting and operation of the supply. The ratio R_2/R_1 should be very high for most efficient operation. Resistor R_2 has only one function and that is to furnish d.c. bias to start the supply oscillating. Once the supply starts, R_2 can be removed from the circuit without affecting the operation of the unit. However, there is a limit to how high the ratio R_2/R_1 can be made and still develop sufficient bias voltage across R_1 to start the supply. This problem was solved very neatly in the Pacer supply by using a GE #1819, 28 volt, 35 ma pilot lamp for R_2. When S_1 is closed the lamp is cold and its resistance is very low (approximately 50 ohms). This means the ratio R_2/R_1 is low and a high bias voltage is developed across R_1 for starting the supply. However, with power applied, the lamp heats up rapidly and its resistance increases to approximately 800 ohms. Therefore, for all practical purposes R_2 is out of the circuit after the supply starts. The lamp eliminates the cold weather starting problem which has always plagued power supplies of this type. This power supply will start and operate within specifications in an ambient temperature range of—50° C to +70° C (—58° F to +158° F) at 13.8 v.d.c. ±20% input.

Protective Lamp

The lamp serves another very important purpose. If the unit stops oscillating with S_1 closed, a steady state d.c. forward bias is applied between the base and emitter of each transistor. The magnitude of this forward bias is dependent on the ratio R_2/R_1, and if the ratio is sufficiently low the bias will be large enough to cause a collector current flow in both transistors. Since the transistors are not switching, the collector current will be continuous in both Q_1 and Q_2. This collector current will cause the transistors to start heating and this heat, in turn, causes a larger current flow. Eventually thermal runaway will occur, destroying one or both of the transistors.

When the lamp is used for R_2, the R_2/R_1 ratio is low only for an instant when voltage is first applied to the unit. It remains low long enough to start oscillation but not long enough to allow thermal runaway. If, for any reason, oscillations stop while power is applied to the unit, the lamp is already hot and the R_2/R_1 ratio is high. Therefore, the steady state d.c. bias is insufficient to cause thermal runaway, and the transistors will not be damaged.

If the power supply is properly designed, a short circuit can be placed across the output without damage to any of the components. For example, consider the Pacer supply. With S_1 open, connect a jumper from point D, in fig. 1, to ground. If S_1 is now closed the supply cannot start due to the excessive load on the output. The lamp, R_2, will heat up quickly and there will not be sufficient bias developed across R_1 to make the

[*Continued on page 93*]

Mobile Antennas On the Corvair

BY JACK MYERS*, W5KKB

Here are two simple methods of mounting antennas on the Corvair or similar compacts. A roof mount and body mount are described.

THE purpose of this article is to describe how two antennas were mounted on a Corvair. One was a roof-mounted 2 meter whip; the other was a standard body mount used for low frequency operation. The body mount was located in the left backup light hole. It fit perfectly, required no external visible holes, and when the mount is removed the backup light can be remounted. To mount the 2 meter roof antenna a ¼ inch hole in the roof was needed; however, this antenna was removed recently and the hole plugged and repainted for only $7.50.

While the descriptions presented here are specifically for the Corvair, the ideas presented should be applicable to other cars as well.

The antenna base mount is shown after being slid into the chrome backup light rim.

The Body Mount

The idea of mounting an antenna in the backup light hole is relatively new. The author has seen it applied by commercial installers in a 1958 Ford and by K5RGI in a 1961 F-85, in addition to his own 1960 Corvair. It should work on many other cars.

The photos pretty much tell the story. The bolts supplied with the mount were replaced by 4 inch bolts threaded all the way to the head. The backup light socket was removed and the lead tied out of the way. The chrome socket holder assembly was removed and drilled for the mount. In the Corvair, an Antenna Specialists Co. Model M-3 mount was used. This fitted the backup light assembly perfectly.

When the assembly had been drilled, it was used as a template to mark the back of the engine compartment which supplies the main support. Extra nuts on the bolts serve as spacers. After drilling the back of the engine compartment, the antenna mount was trial-mounted and the spacer nuts adjusted.

The mount was then removed and the coax lead connected and run through the chrome assembly into the engine compartment and around the left side and across the front of the compartment. On the right side of the front of the engine compartment was a hole plugged with a thin plastic plug. A hole was cut in the plug and the coax run through it and under the car until it was under the rear seat. Care was used to keep the coax clear of all moving parts such as the coil springs and brake cables.

A hole was drilled in the back side of the well under the rear seat and another through both sides of the front of the well, close to the floor and just to the right of the hump. The coax was then fed through the rear hole, under the rear seat, through the front holes, under the rear floor mat, under the front seat, and under the front floor mat, which was pulled loose at the front right corner to allow space to reach under and pull the coax through. The coax was run just to the right of the hump, so it would not be noticeable.

If the rig is to be trunk-mounted, a hole should be drilled through the trunk wall just above the hump. Since there are many things that must be cleared it is best to use extreme care in locating this hole. It is advisable to make all holes which the coax is run through fairly large, preferably punched to an inch or so, since power cables will also have to be run through them.

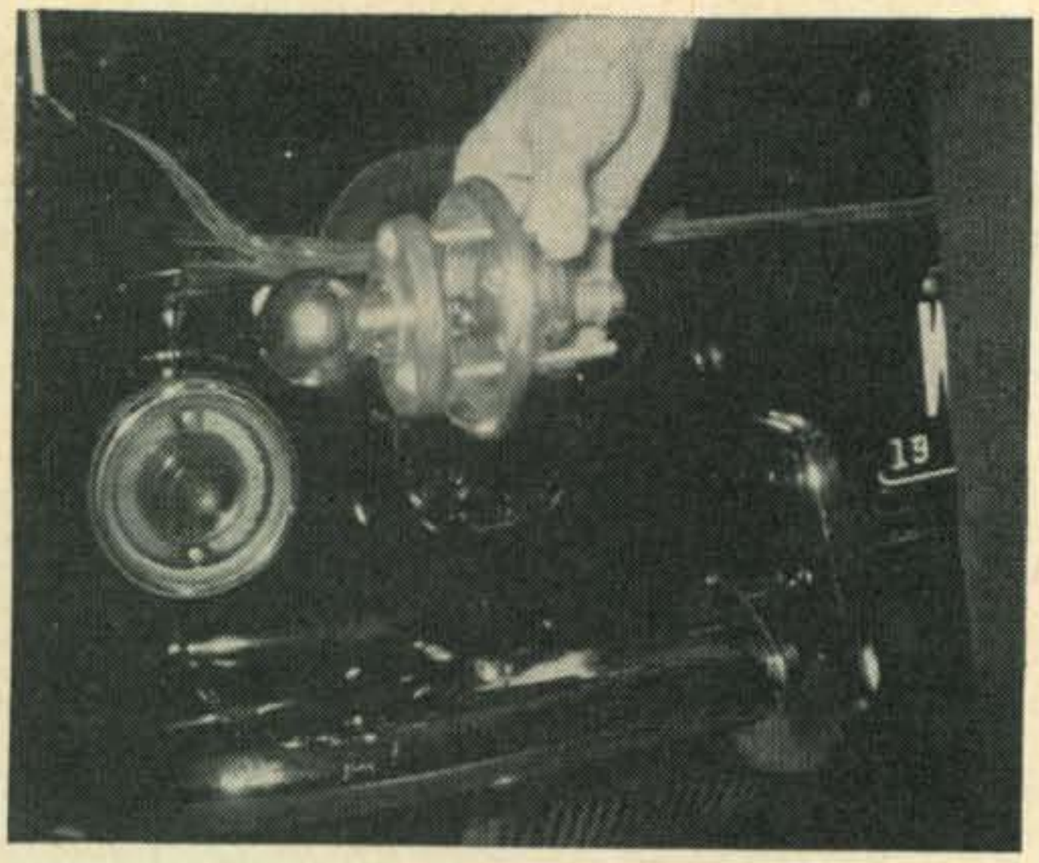
The Roof Mount

The two most difficult things about the roof mount installation were (1) running the cable and (2) building up the courage to drill through the roof. It is highly recommended that the cable be run before the hole is drilled.

First, the dome light assembly was dropped from the roof by removing the plastic cover (just pull it down) and then straightening the lugs that hold up the assembly. Then the rear view mirror, the left side windshielding molding, and the small plate at the top of the center post were removed.

The basic idea was to run the coax along the dome light leads. The lead was fed up

*443 Centenary Drive, Baton Rouge 8, La.



Base mount and backup light chrome ring in position provide a neat mount. When removed, no holes will show.

through the light hole and across the roof to the left side. To reach it, the beading around the edge of the headliner was pulled down and the headliner pulled away from the area above the center post, using care not to tear or stretch the headliner. One hand was wedged under the headliner and used to guide the coax toward the front corner post.

The headliner was removed from around the corner post by pulling the staples that held it in place. By reaching under the headliner it was possible to guide the coax into the channel that the dome light wires are run in. This was the most difficult part of the whole operation. The coax came out under the dash where it was run over to the center of the dash and through a hole into the trunk, using care to keep it clear of the pedals and wipers.

Once the coax was run, the antenna was mounted according to the supplied instructions, the hole being drilled up through the dome light opening at a point which would allow clearance between the antenna and dome light when the dome light was replaced. The top of the hole was left rough, not filed or reamed smooth, so it would dig into the antenna gasket and form a good water seal. No trouble was experienced with leakage.

Conclusions

When some hams first heard of the author's plans to go mobile in the Corvair, they tended to take an "it couldn't be done" attitude. This article shows that while mobiling in a Corvair is not very easy, it is not impossible either.

The author would like to express thanks to Brooks Page, K5LRQ, for his help in installing the body mount and to Bill Fink, K5EMT, and George Gelpi, K5RGI, for their assistance with the roof mount. ■

The Fable of

THE MAN AND THE SIDEBANDS

BY FRED S. ANDERSON*, KØIHG

ONCE upon a time there was a man who despised single sideband. He spoke against it at all the radio club meetings and raved and raved on the air to all he talked to. No one could speak to him without hearing a lengthy, violent, monologue on the evils of single sideband.

One day he visited the shack of a friend who had recently gone sideband, but he didn't know it. When he walked in, he was greeted by the other ham who told him that he had invited him to come and see how sideband worked. The man said he would stay but not until the other ham had gone through a lot of coaxing and pleading. Then the other ham proceeded to show him how sideband worked and he made a few contacts with other sideband stations.

When the man went home he was still dead set against single sideband. He yelled and screamed at his wife about it and knocked over chairs and tables and broke vases because he was so violent in his opposition to sideband. He would finally have a few 807s and go to bed.

When he woke up the next morning he was a changed man. He declared the spirit of open-minded hamming had visited him during the night and changed his opinion of sideband. It must have been true for the man was now an avid supporter of sideband. He spoke in favor of it at all the club meetings and raved and raved on the air to all he talked to. No one could speak to him without hearing a lengthy, violent monologue on the merits of sideband.

Whenever the man came home he was still wildly in favor of single sideband. He yelled and screamed at his wife about it and knocked over chairs and tables and broke vases because he was so violent in his praise of sideband. He would finally have a few 807s and go to bed.

MORAL: *Never Trust a Man Who Has Had a Few 807s.*

*2921 Natchez Ave., Minneapolis 16, Minn.

Improvements for the W3JHR S.S.B. Exciter

BY COMMANDER PAUL H. LEE*, W3JHR

SINCE the article on the "Crystal Filter Type S.S.B. Exciter" was written, I have made several changes in the sideband generation circuitry which result in improved operation.[1] Figure 2 on page 34 of the original article should be replaced by the revised circuit shown in fig. 1.

480 KC Oscillator

The cathode resistor is changed from 1.5K to 1K. The plate voltage is supplied at different levels to the two triode sections. This results in cooler and more stable operation of the oscillator section and in increased output from the cathode follower section.

The small tuning capacitor is moved to a position across the coil, which also results in increased frequency stability.

Audio Stage

The gain is reduced by using only one stage of the 12AX7 tube to drive the balanced modulator. This results in a lower hum and noise level, and in running with the audio gain control further open. Certain 12AX7's have heater-to-cathode leakage which causes hum. This was completely eliminated only by finally grounding cathode pin 8 of the tube, and using a 1.5 volt penlite cell as fixed bias.

Balanced Modulator

The 12AU7 modulator tube is replaced by a 12AX7, which results in increased gain and greater output. The common cathode resistor is changed to 1.5K to optimize the bias for the 12AX7. A 30K grid resistor is used instead of 0.1M for the audio side of the tube. This seemed to help in obtaining a good carrier null, possibly due to some stray r.f. coupling into this grid.

In the output circuit the values in the resistance balance circuit are changed. A small differential capacitor, a Johnson Type 160-308, 14.2 mmf per section, is used to obtain reactance balance. In addition, a small fixed capacitor across one side of the differential was required. This is not shown in the schematic, as its position and value will vary with circuit layout. These changes result in ability to obtain a deep carrier null without careful selection of 12AX7 tubes.

The capacitor C_e shown in the schematic, represents one 40 mf section of the cylindrical can-type electrolytic capacitor shown in the photo on page 35 of the original article. This capacitor, not indicated in the original schematics, is merely a bypass, decoupling, and additional filter capacitor on the plus 300 volt circuit.

The above changes are recommended if you wish to clean out any trace of hum that may appear due to 12AX7 internal capacity or leakage, to have increased carrier frequency stability over long periods of operation, and to obtain a deeper carrier null.

Crystal Filter Passband

In addition to the above changes, I have replaced all channel 343 crystals in the crystal filter with channel 57 crystals. Channel 57 is on 475.926 kc. This change results in an i.f. passband which is about 4 kc wide at the top, instead of 3 kc. This gives me a more natural sounding signal, which I like. This is a matter of individual preference, however, and some readers may prefer to leave the passband as is. ■

*5209 Bangor Drive, Kensington, Md.

[1]Lee, Commander Paul H., "Crystal Filter Type S.S.B. Exciter," *CQ*, November, 1961, page 32.

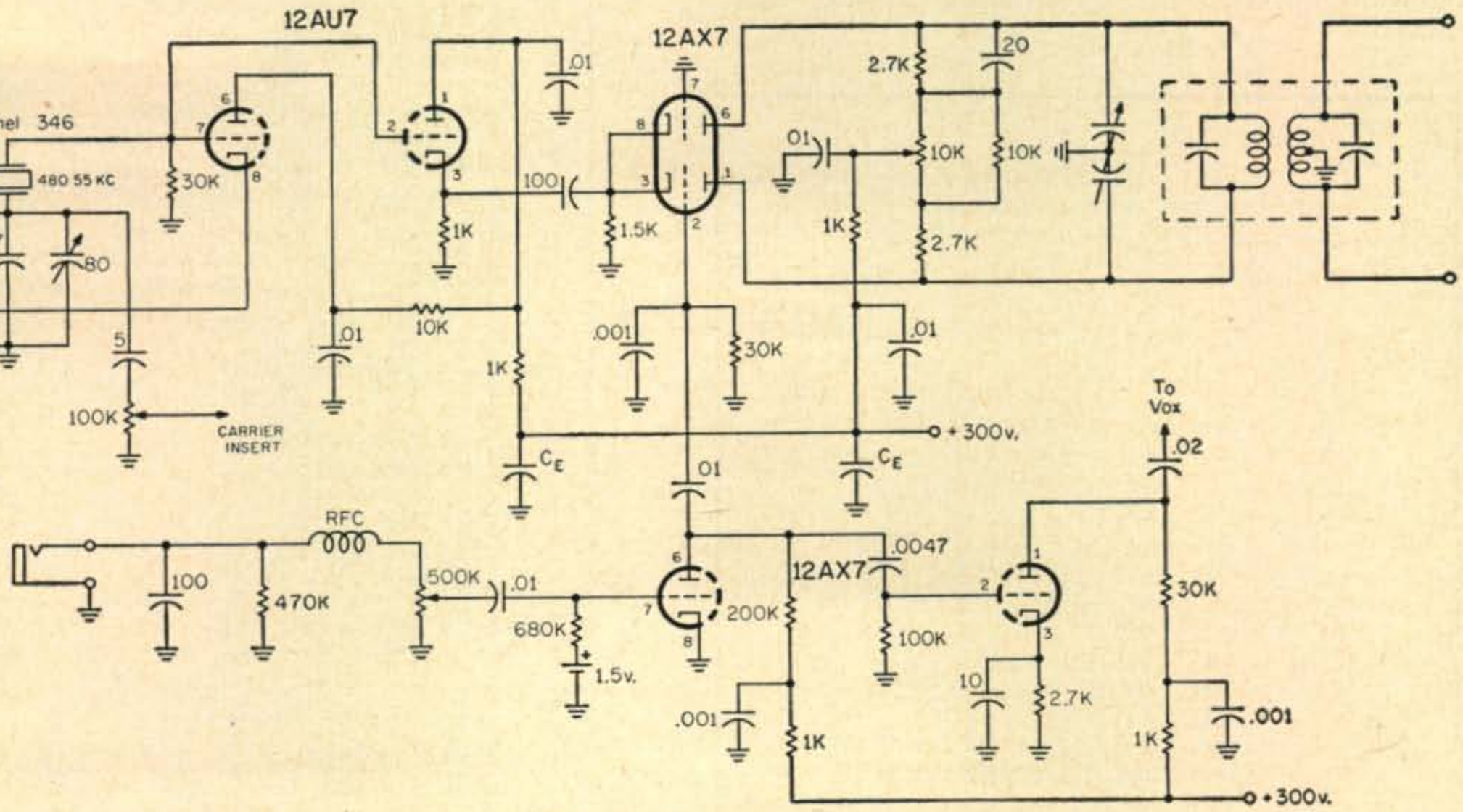


Fig. 1—Revised circuit of the W3JHR s.s.b. generator.

Operating Across The U.S.-Canadian Border

BY DON SELWYN*, W2GFR

Contemplating a visit across the border? It will be lots more fun with radio gear along. W2GFR summarizes amateur privileges for visiting Americans in Canada and Canadians in the United States.

ACROSS-the-border amateur operation can be lots of fun. Traveling through rural areas becomes more interesting and many contacts are often made with stations not normally heard from the home QTH. Canadians visiting the U.S. will find amateur radio a great boon, particularly if mobile on ten, six or two meters. Through local contacts, he is likely to meet American amateurs wherever he goes and usually finds them to be very hospitable. Besides making across-the-border visits more interesting and acquainting visitors and hosts alike with the equipment and customs of each other, these experiences go a long way toward building and improving international friendship.

Reciprocal Agreement

The U.S.-Canadian agreement with regard to reciprocal radio privileges was established as an experiment after much negotiation and with some trepidation. It was the first such agreement entered into by the United States and may well be the forerunner of similar agreements with other nations in the future. Under the terms of the U.S.-Canadian Treaty[1] which became effective on May 15, 1952, amateur and other specified mobile radio services in each country may be operated across the border and on territory of the other country provided that a permit is secured from the host country before the border is crossed.

Amateur operation across the border must be in accordance with the rules of the host country at all times and it is advisable for anyone contemplating such a trip to secure the rules and regulations of the country to be visited. The importance of familiarizing yourself with the rules of the country you intend to visit cannot be overstressed since any rules violation is a treaty violation which can lead to serious consequences. An operating permit should be secured before leaving since Customs will seal the transmitter if you do not show a permit. Should this occur, you will have to return to Customs to have the seal broken in the event you do obtain a permit later during the visit. This is because the radio regulatory agency does not have authority to break the Customs seals and you cannot do so yourself.

Americans Visiting Canada

Americans visiting Canada have certain advantages so far as frequency allocations are concerned. Table 1 shows the various bands and the types of emission permitted on each. Maxi-

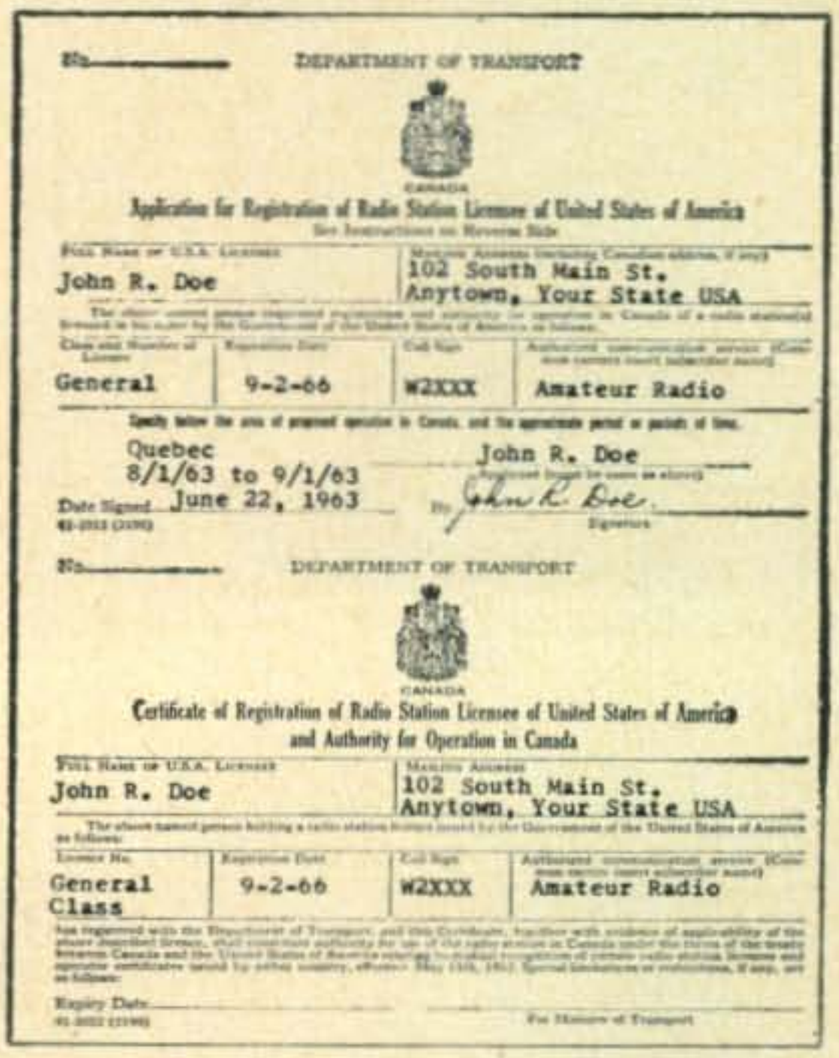
*13 Yale Way, Oakland, N. J.

[1]"Treaty with Canada Relating to Mutual Recognition by the United States and Canada of Certain Radio Station and Operator Licenses Issued in Either Country," available for 5 cents from U.S. Gov't. Printing Office, Washington 25, D. C.

TABLE I

Frequencies and emission types available to U.S. amateurs when operating in Canada.

Frequency (Mc)		Emission Types
1.800—	1.825	A1, A3, F3
1.875—	1.900	A1, A3, F3
1.900—	1.925	A1, A3, F3
1.975—	2.000	A1, A3, F3
3.500—	3.725	A1, F1
3.725—	4.000	A1, A3, F3
7.000—	7.150	A1, F1
7.150—	7.300	A1, A3, F3
14.000—	14.100	A1, F1
14.100—	14.350	A1, A3, F3
21.000—	21.100	A1, F1
26.960—	27.000	A1, A2, A3, F3
28.000—	28.100	A1, F1
28.100—	29.700	A1, A3, F3
50.000—	51.000	A1, A2, A3, F1, F2, F3
51.000—	54.000	Aø, A1, A2, A3, F1, F2, F3
144.000—	148.000	Aø, A1, A2, A3, F1, F2, F3



DEPARTMENT OF TRANSPORT

CANADA

Application for Registration of Radio Station Licensee of United States of America

See Instructions on Reverse Side

Full Name of U.S.A. Licensee	Mailing Address (including Canadian address, if any)
John R. Doe	102 South Main St. Anytown, Your State USA

The above named person holding a radio station license issued by the Government of the United States of America as follows:

Class and Number of License	Expiration Date	Call Sign	Authorized communication service (Complete service (specify authorized mode))
General	9-2-66	W2XXX	Amateur Radio

Specify below the area of proposed operation in Canada, and the approximate period or periods of time.

Quebec 8/1/63 to 9/1/63

Date Signed June 22, 1963 — By John R. Doe (Signature)

DEPARTMENT OF TRANSPORT

CANADA

Certificate of Registration of Radio Station Licensee of United States of America and Authority for Operation in Canada

Full Name of U.S.A. Licensee	Mailing Address
John R. Doe	102 South Main St. Anytown, Your State USA

The above named person holding a radio station license issued by the Government of the United States of America as follows:

License No.	Expiration Date	Call Sign	Authorized communication service (Complete service (specify authorized mode))
General Class	9-2-66	W2XXX	Amateur Radio

has registered with the Department of Transport, and this Certificate, together with evidence of applicability of the above described license, shall constitute authority for use of the radio station in Canada under the terms of the treaty between Canada and the United States of America relating to reciprocal recognition of certain radio station licenses and operator certificates issued by either country, effective May 15th, 1952. Special limitations or restrictions, if any, are as follows:

Expiry Date: _____ For Minister of Transport

Fig. 1—Completed application (form 2190) for American operation in Canada. Lower half becomes an operating permit when validated and returned to the applicant by the Canadian Department of Transport.

FCC Form 410-1
January 1960

United States of America
FEDERAL COMMUNICATIONS COMMISSION

Form Approved
Budget Bureau No. 52-R1384

REGISTRATION OF CANADIAN RADIO STATION LICENSEE AND
APPLICATION FOR PERMIT TO OPERATE

(See Instructions on the Reverse Side)

SERIAL NO.

Name of Canadian licensee | Mailing address (including U. S. address, if any)

The above named person requests registration and permit for operation in the United States of the radio station(s) licensed to him by the Government of Canada as follows:

License No.	Expiration date	Call sign	Authorized communication service (Common carriers insert subscriber's name)

Specify below the area of proposed operation in the United States, and the approximate period or periods of time.

Applicant (Must be same as above)

Date signed _____ By _____
Signature

FCC Form 410-2
January 1960

United States of America
FEDERAL COMMUNICATIONS COMMISSION

SERIAL NO.

CERTIFICATE OF REGISTRATION OF CANADIAN RADIO STATION LICENSEE
AND PERMIT FOR OPERATION IN THE UNITED STATES

Name of Canadian licensee | Mailing address

The above named person holding a radio station license issued by the Government of Canada as follows:

License No.	Expiration date	Call sign	Authorized communication service (Common carriers insert subscriber's name)

has registered with the Federal Communications Commission, and this certificate, together with evidence of applicability of the above described license, shall constitute authority for use of the radio station in the United States under the terms of the treaty between the United States and Canada relating to mutual recognition of certain radio station and operator licenses issued by either country, effective May 15, 1952.

FEDERAL COMMUNICATIONS COMMISSION

Secretary

Fig. 2—A Canadian operating in the U.S. would complete this form 410 and return it to the FCC and would receive, in return, the lower half of the form properly validated.

mum power on all bands except those indicated is 750 watts d.c. input to the final. All 160 meter operation is limited to 375 watts input during the day and 150 watts at night. Further, the two segments between 1.8 mc and 1.9 mc are for use in Newfoundland, Nova Scotia, Prince Edward Island, New Brunswick, Quebec, Ontario, Keewatin and Franklin. Stations operating in Manitoba, Saskatchewan, Alberta, British Columbia, Yukon Territory and Mackenzie must use the two segments between 1.9 mc and 2.0 mc. Eleven meter amateur operation is permitted American visitors between 26.960 and 27.000 mc but only properly licensed *amateur* stations may be contacted. Operation on the 420 mc band is limited to a maximum on 75 watts input to the final r.f. amplifier. Whether operating phone or c.w., your station must be identified as to location at least once during each contact. In addition, your FCC assigned call is used with the proper Canadian prefix identifying your location. If in Ontario, for example, W2XXX would identify his station on c.w. as W2XXX/VE3 and on phone as W2XXX Portable VE3 or Mobile VE3. In addition, he would give the name of the nearest village or city at least once during each contact. Only English or French may be used.

In preparing for a trip to Canada, the first thing to do is write to the Department of Transport for the permit application, Form 2190, "Extracts from General Radio Regulations, Part II," Form AR-5-80, and "International Communitions Restrictions for Land Stations," Form AR-5-81. This request should be mailed six weeks or more prior to the anticipated departure date and should be addressed to: Telecommunications Branch, Department of Transport, Ottawa, Ontario.

Also available, directly from the Queen's Printer in Ottawa, Ontario, are the complete regulations. There are also some excellent reference books[2] available which explain the regulations and answer frequently asked questions.

The application, Form 2190, appears as shown in fig. 1. Note that the approximate area and the anticipated period of operation are shown. These need only be approximate, however, and the anticipated period of operation may be overestimated to facilitate an unexpected last minute extension of the visit. Only the class of amateur license should be inserted where the form calls for "Class and Number of License." The reason for this is that while a combined operator and station license is issued in the United States which bears no serial number, a somewhat different system is employed in Canada where the operator certificate and station license are separate entities. Note also that American licensees of the Novice and Technician classes are *unable to operate in Canada at any time*. All Canadian licensees are presumed to be above Novice and Technician level, however, and are eligible to operate in the United States.

After Form 2190 is completed, it should be carefully checked for errors and omissions which will cause it to be returned without validation and should be sent to Ottawa. Once processed, the lower half is returned to the applicant, numbered, signed and validated. This portion of the card, together with the applicant's FCC license, constitutes authority to transport unsealed radio equipment through Canada and to operate the equipment on Canadian soil in accordance with

[*Continued on page 86*]

[2]J. E. Kitchen, *"Radio Amateur Licensing Handbook,"* Oct., 1960. Available for $2.00 from: Radiotelephone Directories of Canada Ltd., 119 West Pender Street, Vancouver 3, B.C.

TABLE II

Frequencies and emission types available to Canadian amateurs when operating in the U.S.

Frequency (*Mc*)	Emission Type
1.800— 1.825*	A1, A3
1.875— 1.925*	A1, A3
1.975— 2.000*	A1, A3
3.500— 3.800	A1, F1
3.800— 4.000	A1, A3, NBF3
7.000— 7.200	A1, F1
7.200— 7.300	A1, A3, NBF3
14.000— 14.200	A1, F1
14.200— 14.350	A1, A3, NBF3
21.000— 21.250	A1, F1
21.250— 21.450	A1, A3, NBF3
28.000— 28.500	A1
28.500— 29.000	A1, A3, NBF3
29.000— 29.700	A1, A3, NBF3, F1, F3
50.000— 50.100	A1
50.100— 51.000	A1, A2, A3, A4, NBF1,2,3
51.000— 52.500	AØ, A1, A2, A3, A4, NBF1,2,3
52.500— 54.000	AØ, A1, A2, A3, A4, NBF1,2,3, FØ-F4
144.000—147.900	AØ, A1, A2, A3, A4, FØ, F1, F2, F3
147.900—148.000	A1

*For details on special restrictions, see *CQ*, April '63 p. 14.

CQ Reviews:

The Delphi Model 112 Field Intensity Meter

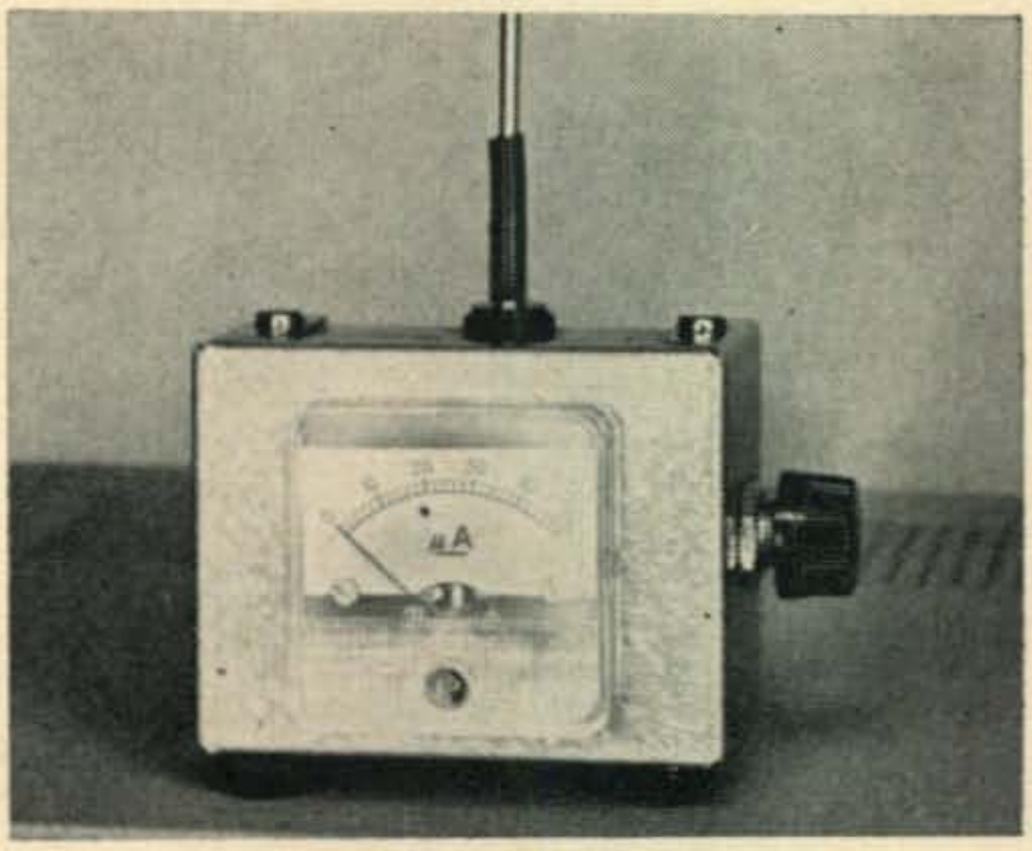
THE Delphi Model 112 Field-Intensity Meter is a compact device which is handy for checking antenna radiation, monitoring transmitter output or for tuning-up purposes.

It employs a 50 μa meter, with an adjustable sensitivity control, in conjunction with a pair of semi-conductor diodes to obtain good sensitivity in spite of the fact that the unit is an untuned device.

R.f. pickup is obtained by means of a short antenna (12") which is mounted on top of the meter case with a plug-in type pin jack. Greatest sensitivity is realized in the 150 mc region; however, it was found high enough at 27 mc to make the instrument very useful as an aid for tuning up 100 mw transistorized walkie-talkies. Higher overall sensitivity may be obtained with a longer pick-up antenna or with a loading coil inserted at the base of the antenna furnished.

It thus may conveniently be used as an indicator while the transmitter is tuned up for maximum output, or as an output monitor. For a.m. monitoring, the sensitivity control may be adjusted for a half-scale reading when the unmodulated carrier is on. Normal 100% modulation on voice peaks will then kick the meter slightly upward (about one-half scale division).

With a controlled-carrier a.m. system, adjustment may be made for a carrier reading of about one-quarter scale, and voice modulation will then kick the meter up to between one-half and three-quarters scale.



The Delphi Model 112 field intensity meter.

With c.w. or s.s.b., the sensitivity control may be adjusted to the point where keying or voice-modulation kicks the meter up from zero to about half scale.

This useful piece of gear also may be used for checking antenna adjustments, radiation patterns, *etc*. The Delphi Model 112 sells for $9.95. —*W2AEF*

CQ Reviews:

The Knight-Kit T-60 Transmitter

IN the past few years there has appeared on the market a group of small transmitters particularly suited to the needs of the Novice. These little rigs also do an excellent job as stand-by transmitters for the more seasoned ham. After looking over the Knight-Kit T-60 and studying the diagram one could not help but be impressed at the value represented. The attractive packaging of the transmitter makes it an asset to the appearance of the shack. Good quality components are used throughout so that correctly built, this little rig will give many hours of pleasurable operation.

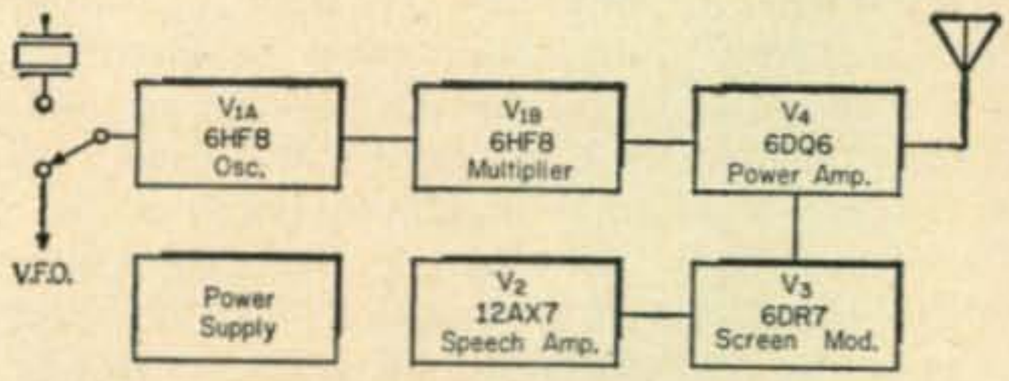


Fig. 1—Block diagram of the Knight-Kit T-60 Transmitter, available from Allied Radio for $49.95.

The Circuit

Figure 1 shows a block diagram of the transmitter. A 6HF8 functions as the first two r.f. stages. The triode portion is connected as a Pierce crystal oscillator or can be used as an amplifier for the v.f.o. The pentode section is a frequency multiplier with series coils controlled by a progressively shorting switch. The coupling between this circuit and the grid of the final amplifier for the v.f.o. The pentode section is a looks like a pi-network, but on close inspection it becomes evident that the grid capacity remains the same, regardless of frequency, so it probably acts as a straight series tuned circuit. Another unusual piece of circuitry is the controlled carrier modulator. An explanation of its operation appears in the Manual. Essentially, when an audio signal is impressed on the grid of V_3, rectification takes place causing the grid voltage to increase. The two sections of the 6DR7 are directly coupled so that any rise in the grid voltage of the first section will be proportionally reflects in the cathode of the second section. The time constant of an *R-C* circuit determines this variation. A voltage divider network appears in the cathode circuit and the volt-

age at the tap between these resistors is applied to the screen of the 6DQ6. This voltage varies at an audio rate proportional to the modulating signal from the speech amplifier and thus modulates the screen of the final tube by changing the potential applied to it. Some feedback is introduced, thus limiting the distortion products and keeping the bandwidth of the final within reasonable limits.

The power supply is a full-wave voltage doubler using silicon "top hats." This type of power supply has become quite popular recently and is used where a light duty-cycle is all that is demanded.

Operation

The tuning and operating instructions were followed very carefully when it was ascertained by resistance check that everything was correctly wired. A table of resistance values is included in an addendum and the practice of making a complete resistance check before applying power is highly recommended. The measured r.f. output into a dummy load was 40 watts on 75 and 40, and fell off somewhat at the higher frequencies. On 10 meters the measured output was 26 watts and on 6 meters—and this is one of the few transmitters in this class that included the six meter band—the output was about 16 watts.

One point to be remembered — the r.f. volt meter has a certain amount of inertia and will swing during voice transmissions. It should never be allowed to swing as high as on c.w. or splattering and distortion will result.

This little rig is easy to tune, good to look at and operates with a smoothness that a Novice will appreciate and an old timer will enjoy. It is easy to build and offers a value which is difficult to beat in these days of rising prices.
—W2KHE

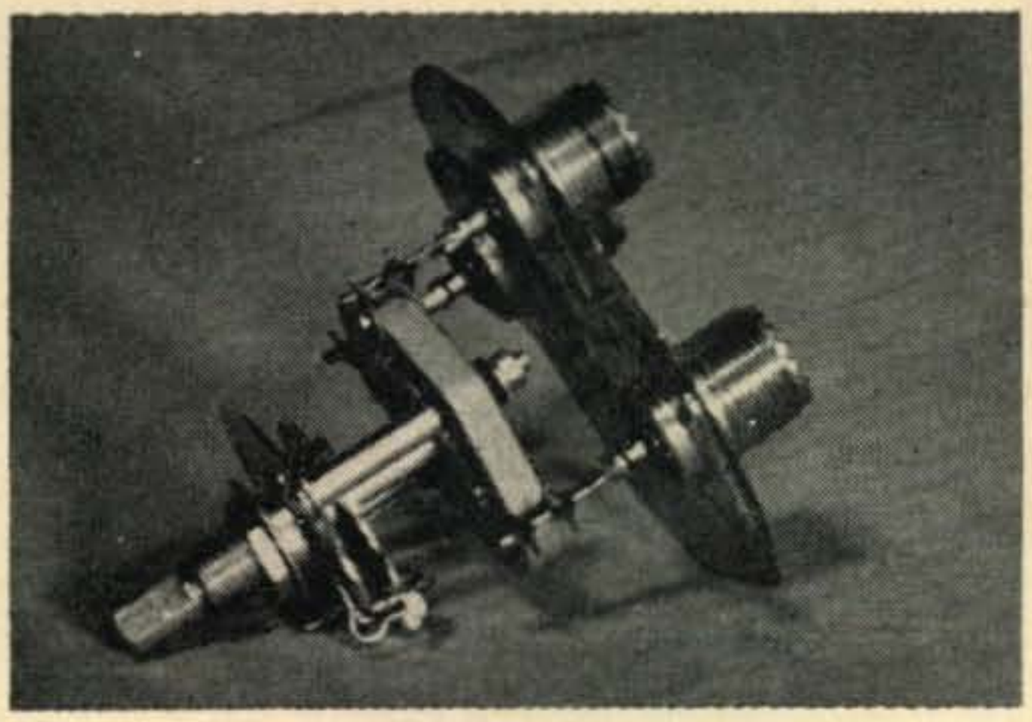
CQ Reviews:

The Waters Coaxial Switches

Do you ever become entangled in a bunch of cables, trying to tell which one is which, or which connector to use when switching around antennas, exciters, transmitters, converters or receivers. Well, if you do, a switch for coaxial lines will certainly provide a welcome relief. Such a switch is made by Waters Manufacturing, Inc., whose slogan "Waters Un-nettles Rigs" so aptly terms the desirability of such a device.

These are high-quality products employing special ceramic switches with silver-plated contacts and interconnections, and having dual contacts which are connected in parallel, thereby assuring positive and low resistance r.f. connections, good current or power-handling capacity and a measure of protection in the event the switch is accidentally rotated while power is applied.

Each switch is mounted in a sealed metal case on the side of which is stamped a schematic diagram of the switch. The connectors are SO-239 (UHF Type), and are mounted at the rear of the case. This makes it possible to extend the connecting cables directly from the rear in a small group. The result is a neat and compact arrangement, especially when the switch is mounted on a panel, provisions for which are made by three tapped mounting holes at the front.



The switches are sealed in steel cans and to even see the switch mechanism, a can opener must be resorted to. Note the double wiper contacts on the ceramic switch section.

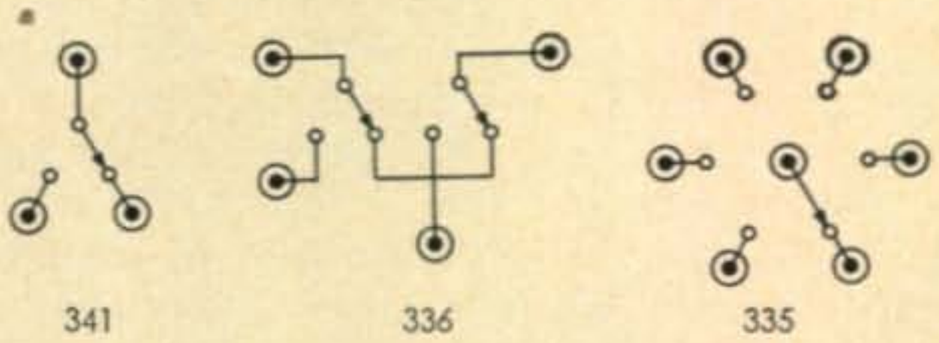


Fig. 1—Schematics of the Waters coax switches.

A molded phenolic knob is provided, as well as a self-marking 4" diameter escutcheon plate. The plate has white identification pads for each function. These may be marked using pencil, India Ink or typewritten labels.

Three models are available to provide a variety of functions. Model 335 is simply a 6 position selector switch; model 336 is a transfer switch for inserting or removing a linear amplifier, *etc.*, from a circuit; model 341 is a two position selector switch. Schematics of the three models are shown in fig. 1. Models 336 and 341 are only 3¼" in diameter with model 335 being 4". Electrical specs are shown below.

Power rating (Max.)	1,000 watts
Current rating (Max.)	5 amperes
Voltage rating (Max.)	500 volts r.m.s.
V.s.w.r. @ 50 ohms	Less than 1.1 up to 150mc
Insertion Loss	Negligible
Cross Talk	Negligible

Switching should not be done with transmitter power applied. The current and power ratings

[*Continued on page 88*]

Design of Yagi Antennas

BY FREDERICK W. BROWN*, W6HPH

This article covers basic end-fire array theory and presents, for the first time, a design method for Yagis that will produce maximum gain.

YAGI type antennas have a strong appeal to the amateur because, within a limited gain region, they yield more gain for the amount of space consumed than most any other form of array. None the less, there seems to be some mystery as to how Yagis work and little practical knowledge available (outside of a tedious cut-and-try procedure) for building high performance models.

The experimenter who builds a Yagi from dimensions published in a magazine article or handbook will almost always be disappointed in the results if he bothers to measure gain by the honest method[1]. The published design usually falls far short of optimum performance because more often than not the dimensions were arrived at by guesswork in the first place; and the gain was then usually checked (if it was checked at all) by a measurement procedure of doubtful veracity. Factory made Yagis are little better, in fact some are evidently made directly from dimensions published in the handbooks.

The method outlined here, if properly applied, gives *optimum* performance *every* time. What's more, it does not require element pruning and the whole process is accomplished almost in less time than it takes to tell it.

But before getting into practical Yagi design, let's be sure we understand some of the elementary principles involved.

How They Work

Yagis belong to a class of antennas known as *end-fire arrays*, most of which can be conceptually separated into two parts: a *launcher* and a *slow-wave structure*. For the case of a conventional Yagi, the launcher is customarily a dipole-reflector combination, and the slow-wave structure a string of directors. This configuration is usually the most practical in terms of such things as weight and wind resistance, but is by no means the only form an end-fire array may take.

For instance, a corner reflector or horn may be used for the launcher, and one of the most effective Yagi designs from a bandwidth standpoint uses a V antenna launcher[2]. The slow-wave structure also may take many different forms, such as a dielectric rod or any form of artificial dielectric (a string of directors may be regarded as an artificial dielectric structure).

It is important to understand how any antenna achieves gain. Because it is a passive device, it can only radiate as much power as is fed into it. Gain comes about by taking power that would otherwise be wasted in a wrong direction and concentrating it in the desired direction. Gain therefore implies directivity and there can be no such thing as an antenna with gain in all directions (in 3 dimensions).

Looked at from a receiving standpoint, we know that the signal delivered to the receiver is proportional to the gain. Since the power delivered to the receiver is extracted from the passing electromagnetic wave, it is logical to view the receiving antenna as an aperture with a given "capture area."

Suppose, for instance, we have a receiving antenna with a capture area of 2 square meters. If the incident electromagnetic wave has a field strength of 3 micro-micro watts (or more correctly, 3 picowatts) per square meter, our antenna would deliver $2 \times 3 = 6$ picowatts to the receiver. (That may not sound like much power, incidentally, but 6×10^{-12} watts is really a fairly strong received signal).

Since we know from reciprocity that the transmitting and receiving gains are identical; gain, directivity, and aperture must go hand in hand and contrary to what is often believed we never have one without the other[3].

For a broadside type of array, the relationship between gain and aperture is intuitively evident since the effective aperture is approximately equal to the physical area (for a well designed antenna), and the signal delivered to

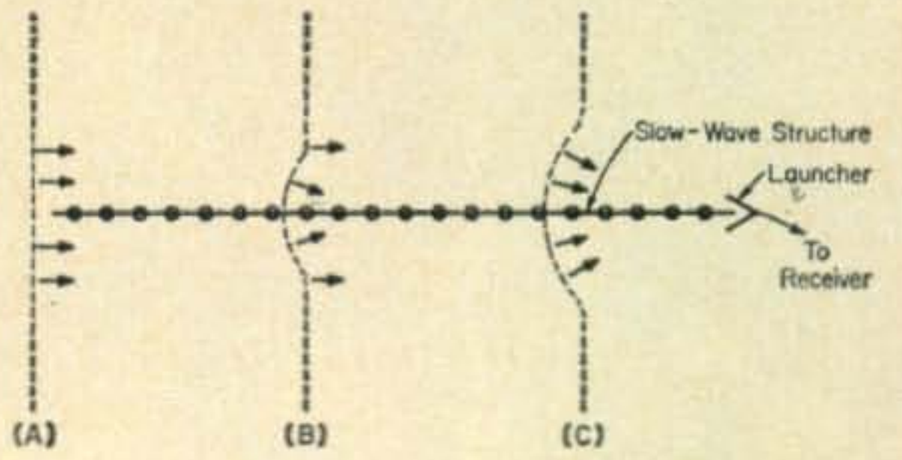


Fig. 1—Action of the incoming wavefront as it encounters the slow-wave structure. As the plane wavefront moves toward the launcher, a dent is gradually produced, (B) and (C), causing the r.f. energy to converge onto the feed as indicated by the arrows.

*Star Route, Idyllwild, Calif.

[1]Brown, F. W., "How To Measure Antenna Gain," *CQ* Nov. 1962.

[2]Reynolds, D. K. "Broadband Travelling Wave Antennas" 1957 *IRE National Convention Record*, Part 1.

[3]Almost never. Actually it is possible to have directivity without gain if the antenna is inefficient (lossy). Most practical antennas, however, exceed 90% efficiency.

the receiver is simply proportional to this area.

There is some uncertainty, however, as to just how the end-fire array acquires its large aperture; which, of course, it must have if it exhibits gain. We often hear the incorrect statement, "The Yagi makes a good transmitting antenna because of its power gain, but is ineffective for receiving because of its small capture area." Looking at the Yagi head-on (as does the incoming signal), it is understandable how this misconception arises, for all we see, in effect, is a half wave dipole, and would expect an aperture similar in magnitude. How, then, is the large aperture achieved?

Remember that the end-fire array consists of a slow-wave structure placed ahead of a launching (or catching) device (fig. 1). Notice what happens to the incoming wavefront as it moves toward the launcher. That part of the wavefront near the slow-wave structure is slowed down, making a dent or depression in the wavefront (fig. 1b). Now since the direction of propagation for an electromagnetic wave is always normal (perpendicular) to the wavefront, the effect of the dent is to focus the r.f. energy onto the launcher (fig. 1c), thereby greatly increasing the signal delivered to the receiver. In very naïve terms, we might say that the Yagi actually "sucks in" the r.f. Hence its large effective aperture or capture area.

Viewed as a transmitting antenna, just the reverse action takes place, the launcher radiates a spherical wave, but that part of the wavefront near the slow-wave structure is retarded, producing an approximately plane wavefront at the end of the array. Because the direction of energy flow is normal to the wavefront, all of the power in this front will be radiated in approximately the same direction—the condition that gives rise to directivity and gain.

From this simplified and qualitative explanation we might jump to the wrong conclusion that the more the wave is slowed down, the greater will be the gain. Actually, there is an optimum value of wave velocity (or phase velocity) which depends on the array length. Any departure from this optimum (especially a lower velocity) will result in reduced gain. The optimum velocity is that which will produce a phase shift at the end of the slow wave structure of about 180° over what would occur in free space. Figure 2 gives

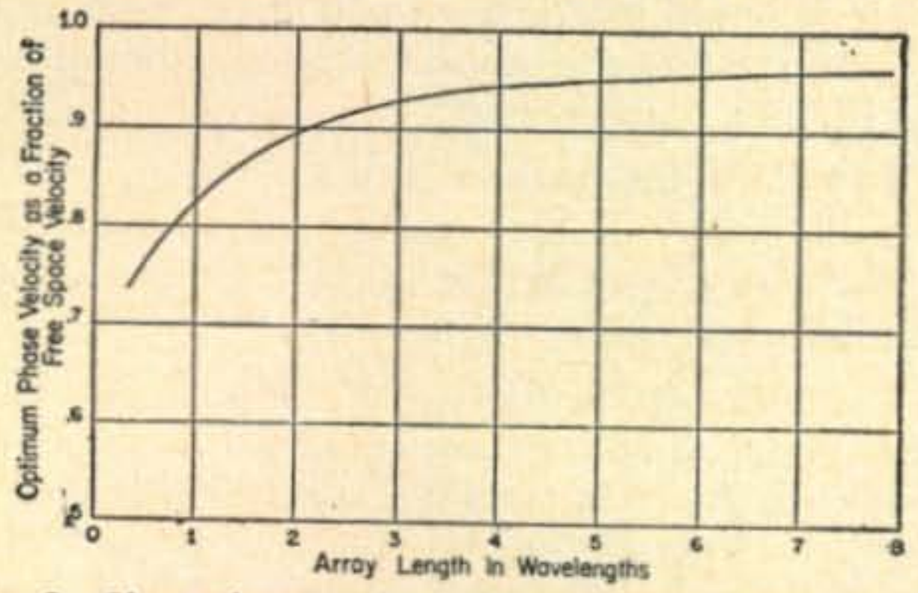


Fig. 2—Chart showing how the optimum phase velocity increases with length for a yagi. Free space velocity (velocity of light) is indicated by the dotted line.

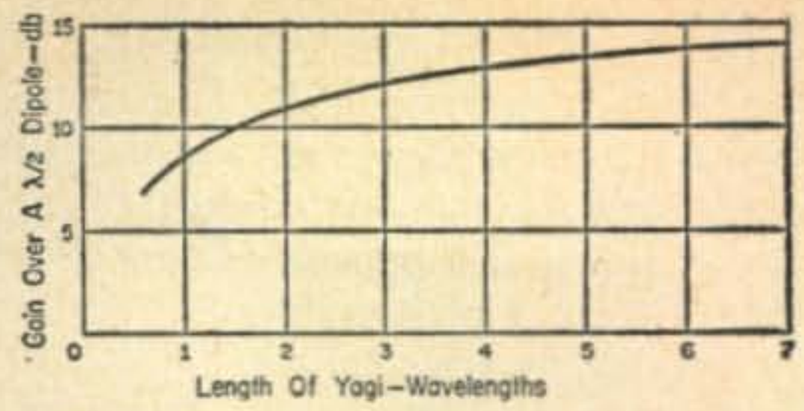


Fig. 3—Chart showing the relationship between maximum attainable gain and length for a yagi antenna. After Ehrenspeck and Poehler.

the optimum phase velocity as a function of array length (measured from the feed point to the far end). Notice that as the array length increases, the optimum phase velocity approaches that of free space. But free space velocity is just what we have *without* a slow-wave structure; i.e., with the launcher alone. So in the very narrow interval between free space velocity and optimum phase velocity, the gain must change from that of the launcher alone to maximum gain for a Yagi of that length. Since the interval becomes narrower as the array length increases, it is not surprising that long Yagis are much more critical to design and adjust than are short Yagis.

The power gain of a classical end-fire array is proportional to length; so ideally 3 db should be added to the gain every time the length is doubled. In practice, however, this 3 db is seldom realized, and in fact is never realized for long Yagis. Figure 3, after Ehrenspeck and Poehler[4] shows the relation between gain and length that may be expected for Yagi antennas. This curve is considerably lower throughout its extent than would be indicated by many Yagi antenna gains claimed in the past. These optimistic gain figures, however, are explainable in terms of the measurement techniques adopted[1]. Figure 3 was determined under precise laboratory conditions and has been experimentally confirmed elsewhere. It can be accepted as the maximum attainable gain for a Yagi of given length.

Notice in fig. 3 that the rate of growth of gain vs. length diminishes with increasing length. A short or moderately long broadside array of dipoles will show less gain than an equal length Yagi. Its rate of growth (power gain is directly proportional to length for a broadside array) does not diminish as rapidly, however, resulting in a crossover point beyond which the Yagi shows *less* gain than an equal length broadside array. This crossover occurs at about 10 wavelengths for a broadside array of half wave dipoles; at about 6 wavelengths for a broadside array of full wave dipoles; and at about 2½ wavelengths for a broadside array of half wave dipoles backed up by reflectors. Of course, both the dipole-reflector array and the full wave dipole array are somewhat clumsier than a Yagi of equal length, but the comparison does show that a point of diminishing return exists for very long Yagis.

[4]Ehrenspeck and Poehler, "A New Method for Obtaining Maximum Gain from Yagi Antennas," *IRE Transactions on Antennas and Propagation*, October, 1959, page 379.

Design Technique

We have seen that the most important parameter involved in the design of end-fire arrays is the phase velocity. For the case of a Yagi, this velocity is determined by four factors listed here in order of their relative influence:

(1) director length
(2) director spacing
(3) director diameter
(4) boom diameter

The phase velocity is lowered by increasing element length, element diameter, or boom diameter; or by decreasing the spacing.

It is important to realize that there are unlimited combinations of these four factors that can yield one and the same phase velocity and only one factor need be controllable in order to construct a Yagi with optimum phase velocity and maximum gain. Of the four, the one that lends itself to easiest control is the second: element spacing. An optimum Yagi may be constructed from directors of fixed length by simply adjusting the spacings for maximum forward gain. Shorter directors will require closer spacings and consequently more elements per unit length. Although there is no gain advantage to either close or wide spacing, since gain depends only on the total array length, a close spaced array does have a slight bandwidth advantage that is purchased at the expense of increased wind resistance.

Figure 4 shows the recommended experimental setup for making optimum Yagis. The directors are laid across wooden rails and can be slid back and forth by means of a notched stick. The spacings are adjusted for maximum received signal from a signal source[5] placed sufficiently far away to meet the distance requirements[1].

The rails upon which the elements rest are designed to have as little effect on the wave velocity as possible. They are made from thin wood and are oriented so that their wide dimension is normal to the electric field. Also, the rails are kept as far as possible from the element ends where voltage gradient is maximum. The frame supporting the rails should hold the Yagi at least its boom length above the ground. It should be constructed so as to place as little material as possible near the antenna, and joints near the rails should preferably be made without nails or screws.

The adjustment procedure should be carried out at a site reasonably free of reflections, ideally an open field.

An attenuator pad[1] placed in the transmission line to the receiver is usually necessary to insure a matched load for the antenna, and to wipe out any r.f. stage gain variation due to impedance changes.

Since small differences in signal strength are practically invisible on an S-meter (due to its logarithmic nature), a v.t.v.m. connected to the receiver second detector should be used for the signal indicator. A.v.c., of course, is turned off. If the detector is operated in its square law[1] region, an additional 2 to 1 magnification of small gain changes is provided.

The procedure for determining optimum element spacings is as follows:

(1) With everything ready as in fig. 4, set the dipole and reflector in place and connect to the receiver. Optimum reflector spacing is always ¼ wavelength, regardless of the number of directors used. Notches for the dipole and reflector may be cut in the rails since these elements will not be moved. Tune in the signal and set the r.f. gain control for about 1 volt d.c. output.

(2) Place the first two directors ahead of the dipole and, standing well behind the reflector, adjust the director spacings with the notched stick for maximum meter reading. At this point the dipole may be matched to the line (only the first few directors will affect the dipole impedance). If a folded dipole and twin lead transmission line are used, a quick and easy match may be achieved with aluminum foil wrapped around the twin lead. Simply adjust the foil (position and length) for maximum meter reading.

(3) Add the third director, placing it well out in front of the first two, and then adjust all directors for maximum signal starting with the second. Go over all spacings at least twice since there is some interaction; and then readjust the match. Beyond this point the match should need no further readjustment.

(4) Add the fourth director, again placing it well ahead of the others and adjust all directors starting with the third, then the second, the first, and finally the fourth.

(5) Proceed as in (4) with the other directors, repeaking all every time a new one is added. You will find the average spacing increases as the array length increases, in agreement with fig. 2. When a new director is added, it is placed well ahead of the others to make room for this increased spacing.

[5]Brown, F. W., "A Solid State Signal Source for 144, 432, and 1296 Mc." *CQ*, May 1961, page 32.

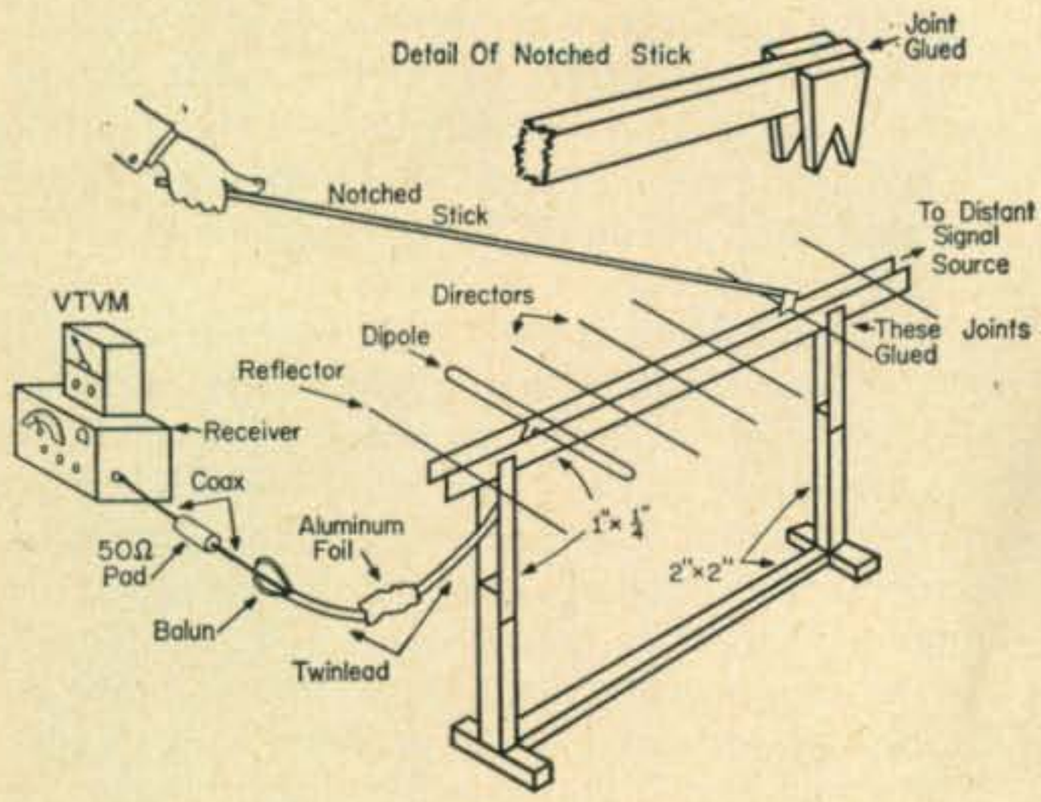


Fig. 4—Suggested experimental setup for developing optimum yagis.

(6) That's about all there is to it. When the Yagi reaches the desired length (remember fig. 3), simply measure the spacings and drill the boom accordingly. As mentioned before, the boom will have a slight effect on the phase velocity, and may or may not significantly affect the gain, depending on the boom diameter, material, and the array length. The boom's effect may be tested by temporarily laying it atop the directors and noting its influence on the received signal. Remember that the wooden rails also have a slight slowing effect on the wave which will at least partially compensate for the boom's presence in the final model.

The only remaining problem is to permanently match the dipole to the transmission line. Measurements at 432 mc indicate that the dipole impedance is reduced to about one half by the presence of the parasitic elements. This reduction is much less than has been reported elsewhere, probably because of the different design methods employed. A 2 to 1 s.w.r. is easy to match with the aluminum foil technique. There is more than one position along the line, of course, where the foil will eliminate standing waves. The correct position is that nearest the dipole. When the proper length and position have been found, the foil section may be wrapped with tape and the whole thing doped with paint to make it weatherproof.

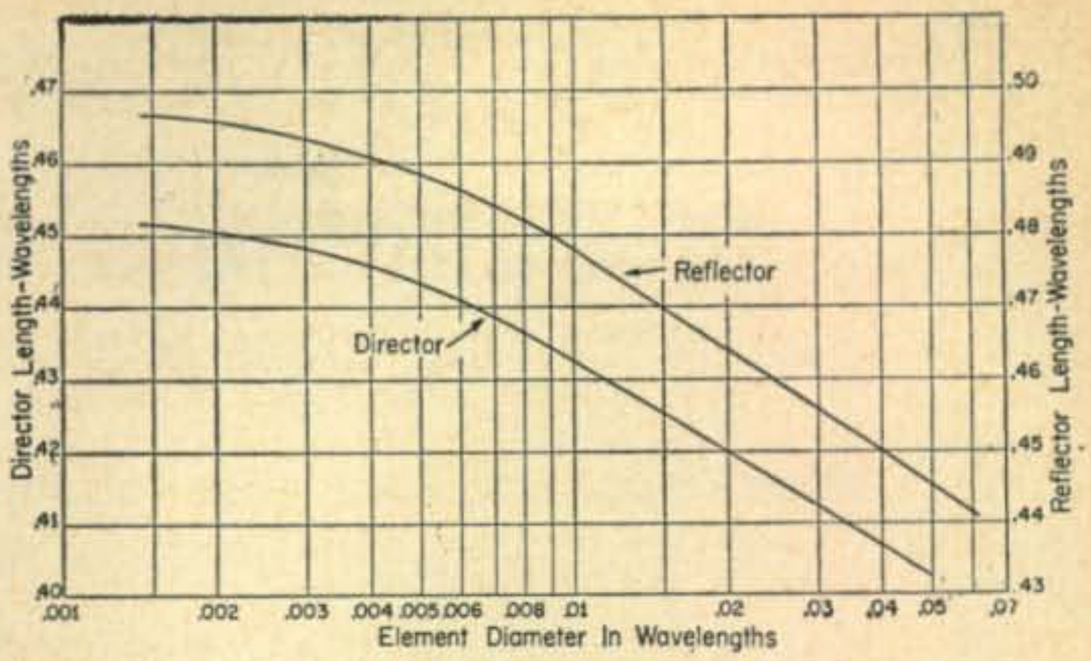


Fig. 5—Director and reflector lengths may be determined from the chart above.

As mentioned earlier, director lengths are not critical within certain limits. A good value for the director lengths, as a function of their diameter, is given in fig. 5. All directors are made the same length, there is no advantage whatever to progressively shortened directors. Ehrenspeck and Poehler[4] have found that director spacings greater than 0.4λ result in a sharp drop in gain. Accordingly, if the spacings turn out to be greater than 0.4λ, it would be wise to shorten all directors by a few percent and start over.

Optimum reflector length is likewise not too critical, and a good value for the reflector length as a function of its diameter is also shown in fig. 5. ■

A Simple Mobile Accessory Cutoff Circuit

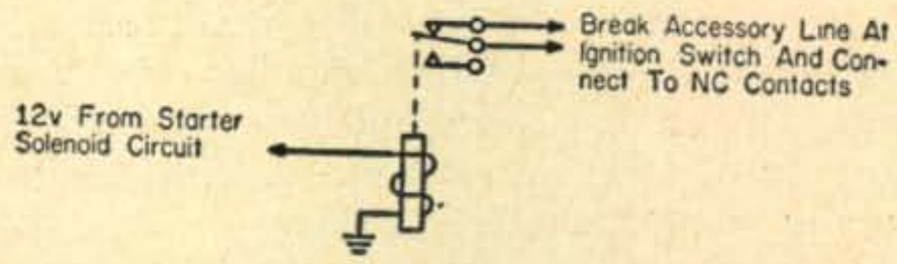
BY JACK MYERS*, W5KKB

SINCE the starter takes a very large slug of current from the auto battery, it is desirable to have all accessories turned off during starting. Some cars have a special ignition switch so that accessories are cut off when the switch is in the start position. However, many cars do not have this feature.

In the author's Corvair the radio, wipers, back-up lights, heater and air conditioner are controlled by the ignition switch, also any mobile rig that may happen to be installed. On any given trip, 3 or 4 of these accessories are usually on. When the car is stopped and then re-started it is advisable to turn off these accessories, particularly the air conditioner or mobile rig. However, to turn off these items and then turn them back on every time the car is started is rather troublesome.

The simple circuit shown eliminates the problem by turning off the accessories when the engine is being started. One heavy duty relay is used. It must be rated for the full accessory current and have normally closed contacts. Although a commercial unit is specified, any surplus 12 volt d.c. relay meeting those specifications would be satisfactory.

The leads which carry the full accessory current should be of wire the same gauge or heavier than that used for the auto ignition switch wiring. ■



This simple circuit relieves the battery of the accessory load current when starting the car. The relay is a Potter Brumfield PR5D. Any surplus relay with a 12 volt coil, whose contacts can handle up to 25 amps, will do as well.

*443 Centenary Drive, Baton Rouge 8, La.

Reviewing The Radio Classics

Modulating a Screen Grid Tube

BY DAVID T. GEISER*, WA2ANU

An evaluation of the common methods of modulating a screen grid tube.

Number 5 of a Series

ROBINSON (*QST*, December 1932 and January 1933, "Modulating the Screen-Grid RF Amplifier) discussed the limitations of control grid, screen grid, plate, and combined plate and screen modulation of tetrodes. While pentodes and beam tetrodes were not in use then, his findings with only minor variation are equally applicable to these tubes.

Amplitude modulation is the process of faithfully reproducing a modulating voltage or current in output voltage variations of a radio frequency wave. Good modulation makes this reproduction with small error. One hundred percent modulation capability means that the carrier output voltage may be varied by the modulating wave from its steady value through the range from zero volts to twice the steady value of carrier voltage (a range of zero to four times steady carrier power.)

Control grid modulation requires the least amount of power, but is quite critical of the amount of driving power, bias, and plate loading required. Even with the best combination of these factors, the modulating grid voltage swing must be limited to the linear region of the grid modulating characteristic, giving a modulation capability of about 60%. The primary reasons for such limitations are that control grid (and screen and suppressor grid) modulation techniques perform the modulation by varying the efficiency of the modulated amplifier and that it is very difficult (if not impossible) to find combinations of operation conditions that will swing efficiency either to zero or sufficiently high for a reasonable amplifier output.

Screen modulation is likewise critical of drive, bias, and modulating voltage. It, like control grid modulation, tends to be more linear with heavy loading but still has a modulation capability of only about 75% with good linearity.

High-level plate modulation when the screen voltage is fixed is susceptable to very high distortion caused by diversion of the electron stream to the screen grid instead of the plate. Derivation of the screen supply through a fairly high value of series screen grid resistor does much to prevent the excess currents and helps make the modulation more linear. Excitation, bias, and load impedance are the critical adjustments; 100% modulation capability with fair linearity can be obtained. Recently, a variation of this method has been used successfully with some tubes wherein a fixed supply feeds the screen through an iron-core choke of 10 henries or so, avoiding the power loss inherent in a large series dropping resistor.

Combined modulation of plate and screen (with the screen fed through a large dropping resistor from the modulated B+) gives excellent linearity with very noncritical adjustments. A variation of this scheme permitting a small increase in linearity (fairly recent vintage) is to bypass end-to-end the screen dropping resistor so that the resistor in combination with the screen bypass capacitor will not look like a low-pass filter to the audio modulation going to the screen. These bypass *reactances* should have the same ratio as their respective d.c. impressed voltages.

Another moderately common combined plate-and-screen modulation method currently used is to place a tertiary (third) winding on the modulation transformer for the screen grid so that it too may be fed from a fixed d.c. supply without series resistor power drop.

(*Author's note:* Each of these modulation methods may be used legally, but the newcomer will probably have least difficulty with the combined plate and screen method using the series dropping resistor. The trapazoidal modulation monitoring method is heartily recommended for use during adjustment of any other type of modulation.) ■

*Light Military Electronics Dept., General Electric Co., Utica, N.Y.

"I used to have my rig under the stairs."

Pentagrid Mixers for S.S.B. Exciters

BY HOWARD L. MORRISON*, W7ESM

The use of pentagrid mixers in homebrew s.s.b. exciters can, if great care is not taken, produce a large number of spurious output signals. The author shows how these spurious signals may be eliminated.

PENTAGRID (five-grid) tubes such as the 6SA7, 6SB7Y, 6BE6, and 6BA7 are familiar to hams because of their frequent use in receivers. In most receivers they are used to change the frequency of the incoming r.f. signal to an intermediate frequency by heterodyning (beating) it with the local h.f. oscillator. In low cost receivers the pentagrid tube also oscillates in addition to its function as a mixer; when used in this way it is called a pentagrid converter. Pentagrid tubes are also often used as product detectors for s.s.b. signals, in which case the i.f. signal is heterodyned with a local l.f. oscillator, and the resulting difference frequencies are the desired audio signal.

Pentagrid tubes were designed especially for heterodyne mixing, and they offer certain advantages over other type tubes in this service. The signal grid (#3) draws no current, and so does not broaden the selectivity of the tuned circuit which drives it, and there is good isolation between the local oscillator and the signal circuits by reason of the screening effect of grids #2 and #4. These, together with other advantages to be described later, are good reasons for using pentagrid tubes as frequency converters in s.s.b. exciters. However, the writer has found that the operating conditions for these tubes in exciter use are quite different from their use in receivers if trouble with spurious signals is to be avoided.

Frequency Conversion In Transmitters

Once any modulated signal—a.m., f.m., s.s.b., or d.s.b. — is generated, its frequency can be changed only by the heterodyne method; that is, mixing it with the signal from a local oscillator (fixed or variable in frequency) in a device whose output will be the sum or difference of the original two frequencies. Such a device is called a mixer, but it must not be considered equivalent to mixers used, for example, in audio systems, where the output of a microphone is combined with that of a phono pickup. In audio mixers, the amplitude of the output signal is the sum of the instantaneous amplitudes of the input signals No new frequencies are produced.

In a heterodyne mixer, the amplitude of one input signal is controlled in accordance with the instantaneous amplitude of the other one — which is another way of saying that it is an amplitude modulator. The modulated amplifier in an a.m. rig is actually a high-level heterodyne mixer, its output being not only the original carrier but new signals whose frequencies are the sum and difference of the carrier and audio signals. New frequencies are generated in the process of this kind of mixing.

A simple numerical example will show why the frequency of a modulated signal can be changed only by the heterodyne method: Say that a 7.250 mc carrier is modulated with 1000 cycles of audio. The sideband components will be 7.249 and 7.251 mc. If a frequency tripler stage were to follow the modulated stage, the new carrier would be 21.750 mc and the sidebands would be 21.7477 and 21.753 mc, and a receiver tuned to it would produce 3000-cycle audio, not the 1000-cycle original. If voice modulation in such a setup were used, the r.f. signal would require a channel three times wider than necessary, and the op would sound highly unnatural. Changing frequency by means of doublers and triplers, even in a.m. rigs, can be done only ahead of the modulated stage. On the other hand, if the modulated carrier in the above example were mixed with a 14.500 mc signal, the new carrier would be 21.750 mc, but the sidebands would still be only 1000 cycles from it: 7.249 + 14.500 = 21.759, and 7.251 + 14.500 = 21.751.

Problems With Heterodyne Mixing

Though heterodyne mixing solves the problem of changing frequency while preserving the frequency difference between the sidebands, it can add two special ones of its own, even with pentagrid mixers, unless special precautions are taken. These special problems are encountered only when the mixer output signal is at radio frequency; they cause no trouble in receivers, where the output of the mixer is very much lower in frequency than either input signal. Both problems stem from the lack of selectivity in the output circuit of the mixer, usually a single *L-C* resonant tank. If the mixer drives an amplifier which requires grid current, the load on the tuned circuit reduces its selectivity still more. Even going to the trouble of using double-tuned circuits often fails to reject sufficiently unwanted signals in the mixer output.

The first problem arises from using a mixer that requires one of the two input signals (usually the ones from the local oscillator) to be at least ten, and preferably more, times stronger than the other in order to minimize distortion in the mixer output. (Distortion means the pro-

*9000 S.W. Beaverton Highway, Portland 25, Oregon.

duction of unwanted frequencies, as will be seen later.) This relation is true for all diode mixers and most other type tubes used for mixing except for pentagrid tubes operated as described below. Pentagrid mixers used in receiving-type conditions also use a strong oscillator signal. To illustrate, suppose that it is desired to get an s.s.b. signal coming from a 460 kc filter into the middle of the 40 meter phone band. It could be mixed with a local oscillator of either 6.79 mc or 7.71 mc to obtain 7.25 mc s.s.b. But notice the difficulty in expecting even a double-tuned r.f. circuit to pass 7.25 mc and reject a signal ten times stronger at 6.79 or 7.71 mc. (If they aren't rejected, pink tickets will soon appear from the FCC. The loaded tank circuits in the linear amplifiers following the mixer will be fairly broad, and so offer only a little help in rejecting the unwanted signals.)

The second problem is the production of harmonics of one or both the input signals, together with beats between these harmonics, or between the original signals and the harmonics, all of which are called "cross-modulation products," or "spurious signals." Some of these unwanted signals often have a frequency such as to get by the mixer output circuit, along with the desired signal. When they do, the least that can happen is a flock of "birdies" in the local receiver—sometimes so many that it is very difficult or even impossible to tell which one corresponds to the transmitter carrier frequency when trying to set the v.f.o. The worst, of course, is that they will get amplified and radiated, clobbering different spots in the band unnecessarily, or else being outside the band altogether and so bring in pink tickets.

Harmonic Generation

A long time before even the telephone was invented, mathematicians had proved that any waveshape can be made up by adding together, in proper amplitude and phase, sinusoidal waves whose frequencies are whole number multiples (i.e., "harmonics") of the frequency which corresponds to the rate of repetition of the original wave. In other words, any repeating wave, whatever its shape, is equivalent to the sum of a series of sinusoidal shaped waves which are harmonically related. Mathematical analysis also shows, and experiments demonstrate, that sharp corners in a wave mean many harmonics. (A theoretically perfectly square wave would have harmonics all the way to infinity.) The important thing to remember from this is that clipping a wave makes sharp corners, and therefore *clipping a wave generates many harmonics.* That is why the clipped output from a 100 kc crystal oscillator provides signals every 100 kc up into the v.h.f. range for calibrating receivers. It is also why a low-pass filter must follow the clipper in a speech amplifier. The filter removes many of the audio harmonics which would otherwise make the op's voice sound harsh and raspy and broaden the signal bandwidth.

Prevention of Spurious Signals

A diode is one of the very best clippers, and when most tubes are driven so hard that grid current flows, the grid-cathode circuit functions as a diode clipper. Now the operating conditions for pentagrid mixers which are found in tube manuals and amateur handbooks are for receiver applications, where things like conversion gain and the ability to handle a very wide range of signal voltages on grid #3 are important. Consequently, high excitation on grid #1 is recommended, with grid current between 0.35 and 0.5 ma, depending upon tube type. Such operation involves clipping of the signal applied to grid #1, and the consequent generation of harmonics. In an s.s.b. exciter built by the writer, when two of the 6SA7 frequency converters in the high frequency section were operated with 0.5 ma current in the grid #1 circuit, there were about six birdies inside the ten meter band alone, with three of them so strong that the one corresponding to the desired output frequency could not be identified for purposes of setting the v.f.o. There were more birdies outside the band. (Incidentally, don't blame all birdies on the exciter. In the case just mentioned there were more birdies which were found to be images in the receiver, itself a fairly expensive double-conversion commercial model.)

In order to find more suitable operating conditions for pentagrid tubes in exciter service, a test circuit using a 6SA7 was set up. 60-cycle and 8 kc audio voltages were used for the control grids, and an 8 kc tuned circuit of fairly high Q was used in the plate circuit. A cathode ray oscilloscope was connected across this tuned circuit for viewing the output waveshape. Such an arrangement allows one to determine not only the bias and signal voltages which cause clipping, but also any significant distortion (implying the presence of harmonics) due to operating on the more sharply curved portions of the tube's characteristics. The scope picture produced by such a setup will be that of an amplitude modulated signal like the ones pictured in the amateur

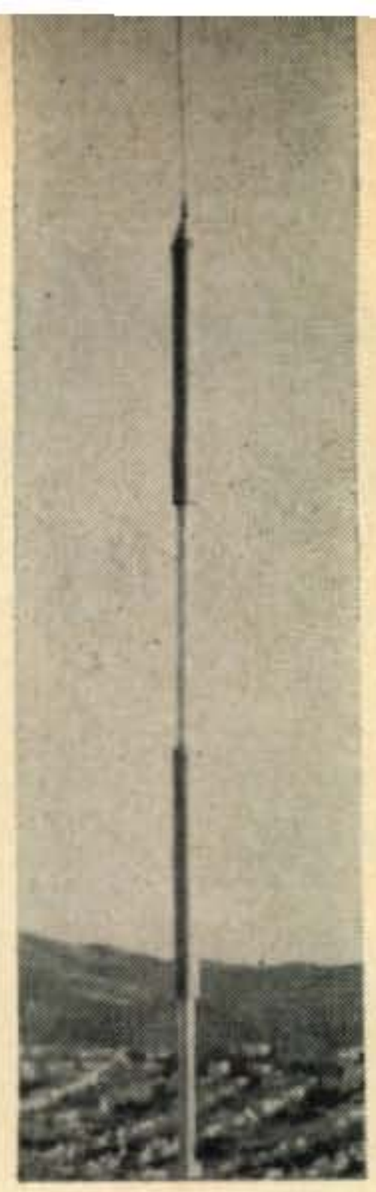
[*Continued on page 89*]

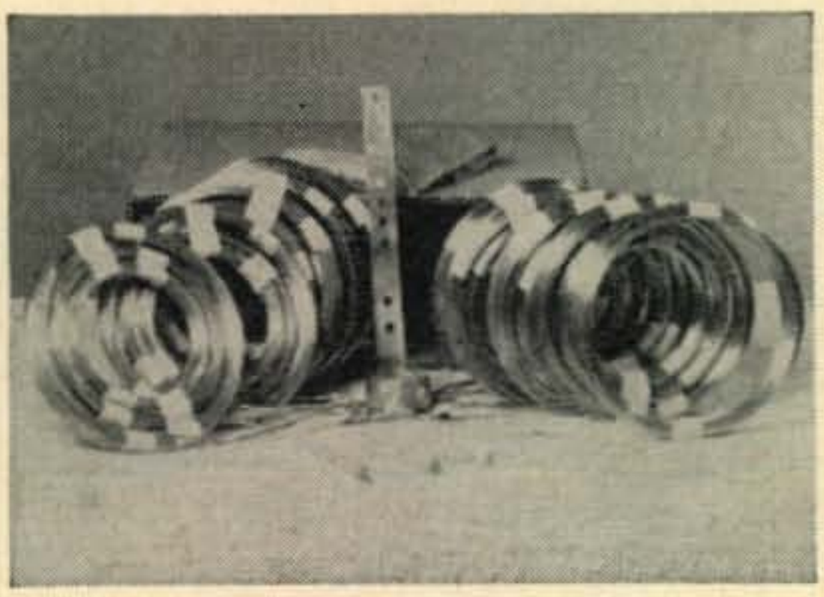
"Skipper . . . would you mind turning the ship through ninety degrees so's I can get a major lobe on an AC4?"

New Amateur Products

2 Meter Coaxial Collinear

FOR the 2 meter enthusiast desiring an omni-directional vertical antenna, Webster Manufacturing Company has announced their new 144 mc coaxial collinear, pictured at right. Featuring low angle radiation with 1.8 db gain, the new Webster Model A-59 has provisions for 4.6 db gain with the addition of two decoupling skirts. With a 1.5 : 1 s.w.r. this 52 ohm antenna has an anodized aluminum whip hand skirt and a high-dielectric, self-cleaning feed insulator. Self-supporting, it can be mounted in a standard 1 inch pipe. It would appear that this radiator might be just the ticket for 2 meter mobile-to-home communications or for net and Civil Defense operations. For further information, circle A on page 110.



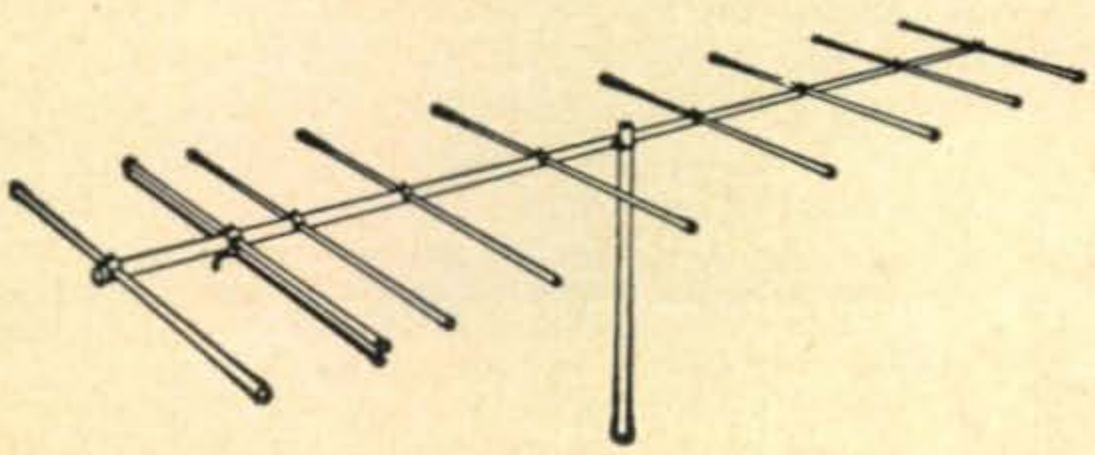


Ground Radial System

APPROPRIATELY dubbed "Ready-Radials," the only amateur radio ground radial system kit on today's market has been released. This system provides improved performance from long wire, vertical, and other ham antennas which are operated against ground. No. 14 solid copper radial wires are electrically and mechanically bonded to a central hub. Drive pegs are provided for securing radial wire ends. Locate center hub where you want it, roll out radials, and you're in business. A 1000 foot kit (ten 60′, eight 33′ and eight 17′ radials) sells for $24.95. Circle B on page 110.

Dymo Tapewriter

IF you are a builder and wish to add that "professional touch" to a piece of equipment, this item may be just what you're looking for. Dymo Industries of Berkeley, California, produces the Dymo M-55 tapewriter, a tool capable of punching any combination of 44 possible characters (including dollar and cent signs) onto a piece of colored plastic tape, suitable for display anywhere. This model sells for $29.95 and comes with carrying case, vertical wheel, and special character wheel. Tapes cost $1.25 per 10 feet. Circle C on page 110.



2 Meter Yagi

THE latest addition to the growing line of Mosley v.h.f. antennas is a 9 element, wide spaced long yagi available for 144 mc operation. Model A-92 incorporates a folded dipole radiating element which offers 300 ohm balanced feed impedance. Rated to 1 kilowatt with 14 db forward gain, 20 db front-to-back ratio, and s.w.r. of 1.5 : 1. $16.40 net. Circle D on page 110.

Results of the
1962 CQ World-Wide DX (Phone) Contest

BY FRANK ANZALONE*, W1WY

THE forecast for generally "poor-to-fair" propagation conditions made by George Jacobs for our Phone Contest last fall, seemed to be more or less "on the button" as W3ASK put it.

The location or band used generally dictated the report, but bad or good, some fellows always manage to come up with an unbelieveable score.

To hear Ed Bissell of W3MSK fame tell it, "its the operator not the equipment that makes a good score." Of course a full gallon on each band had nothing to do with it, and I'm sure 5 elements on 20, 6 on 10 and 7 on 15 are just so many figures to the uninitiated. But in any event the fellows put on quite a show and the Don Wallace, W6AM Trophy goes to W3MSK of the Potomac Valley Radio Club. A new experience for this normally c.w. station.

And conditions didn't seem to hamper (did they ever?) CX2CO. Ricardo teamed up with Daniel, CX7CO, entered the Multi category and added another cup—the Don Merten, K2AAA Trophy—to the Sierra collection. One guess, what category do you think they will enter next year?

Over in the Single Op division, Louis Kaiser once again left his XYL behind to hold the fort with 9G1YL and put XT2Z on the air on all bands. Louis only located the necessary equipment at the last minute but his previous experience paid off and he will be taking the Bill Leonard, W2SKE Trophy back to Switzerland, where he will be by the time you read these results.

I'm sure his victory will be a popular one with everyone, even HC1DC. To bad Don, that was a fine effort on your part but Louis just had a more desirable location.

Once again it was the 14 mc band that produced most of the activity and the highest single band scores. It was a battle between two widely separated Asians, MP4BBW and KA2JL, with Ian winning out by virtue of his larger multiplier. Here again the locational advantage was a big factor in the final score.

Too bad Jim, a few more African countries would have done the trick. The Barry Briskman, K2IEG Trophy would have looked good in your Florida QTH. This was Jim's swan song from Japan.

There were many more 6-figure scores on 20 but space does not permit repetition, the listing speaks for itself. This was VR3O's first effort in a contest.

Strangely enough the only other single band to produce a better than 100K score was 10 meters. Our old friend LU1DAB again complained how bad conditions were, "worse than last year," moaned Jaycee. But take a look at that score, 50% higher than last year. How does that boy do it on a band that's supposed to be dead?

The openings on 28 mc were a pleasant surprise to those who stuck it out. Even K6CT was happy, and 10 is generally tough on the west coast. Of course George credits his success to his polarized diversity beam.

Most of the 28 mc activity was on a.m. and conditions seemed above average down W5-land. But was that cricket OM, beating out a YL. Sorry Sue, it was a close one.

The activity on 21 mc was a mixture of a.m. and s.s.b., and some of the boys (and girl) turned in some nice scores, but conditions were spotty. As an example, AP2MR didn't have a single W/K contact, and Ruth, 9G1YL only had a handful.

The two lower bands were very disappointing. A nip and tuck affair between W3PHL and K2GXI livened up 40, with Fred just nosing out Bob, but as the boys put it, "its pretty rough competing against megawatt propaganda stations."

Stateside, W1BU was the only one to show a score on 80, although some of the All-Band stations used it for a multiplier. Activity over in Europe was more evident and ON4UN beat out I1AIM last year's leader with a narrow margin, by virtue of a few more three-pointers.

Going back to the All-Band division, there doesn't seem to be too much difference in the over all averages from last year's scores. It's good to see that two of our boys, K5MDX and W1ONK made the Top Ten, with K3UDX just missing out. KP4CK's contact total looks like a new high for a single operator. And ZL1AIX proved that it can be done from "down under" and no excuse for the Aussies having only 3 entries.

Reviewing the multi-operator division we find that a group from the German DX Team really stirred up a hornet's nest from San Marino as DJ1ZG/M1; and the group over at DJ3VM made a big improvement in their score over last year. The de Azevedo twosome switched calls to the distaff side of the family and as CT1YE, also improved last year's showing.

The gang at DLØWW, a club station, is the same group that won the trophy last year as

*Contest Committee Chairman, *CQ*.

DJ3OU. This is their sixth year in competition.

And the Tigerstedt family again made their usual fine showing from a difficult location; however, OH5SM went Multi-Transmitter this year. Watch out for this group when we return to the lush years on the higher bands.

That was only a two man team at K6EVR, but a much larger team at the Science Museum put on a jolly good show with GB2SM.

Other DX-peditions included DJ6QT's trip over to LX3QT and W3ZQ's set-up as PJ5MC, both fairly successful, altho Mac thought conditions in the Caribbean could have been better. WØAIH's trip to Bermuda however was disappointing, radio-wise that is. Paul and the XYL had a fine vacation but the available equipment was not adequate for contest work.

The controversial 2-point-per-contact between North American stations, was quite naturally well received over here. Quote WB2CCO, "two points for North American contacts saved the day, since European openings were at a low." You're so right Bernie, too bad more stations didn't take advantage of this bonus.

Disapproval from overseas stations was minimal, but we couldn't pass up JA4AS's remark: "I think it is non-profitable for us that QSO points between both American stations be calculated as 2 points." You've got a point there Dr. Akio.

Actually the increased QSO point value contributed very little to the average scores over here. The hoped-for increase in activity from the Caribbean and Central America did not materialize and no one seemed interested in working the few Canadians that showed up.

Let's hope the c.w. section shows an improvement. Maybe we should forget the noble experiment and go back to the old system.

We are still receiving occasional complaints that 48 hours is too long for a contest. I can't understand VE3CBY's gripe though, since Ray operated 21 mc only. Our Single-Band feature permits plenty of sack time to those who prefer a shorter period. The rugged individual still finds All-Band operation desirable, and of course the Multi-Operator groups are judged on an All-Band score only.

You will note quite an increase in returns from W4-land. This was due to a couple of real live DX clubs; the Florida DX Club and the Virginia Century Club.

In contrast, you will also note that there were exactly *three* entries from the W8-boys. Does the Ohio Valley still exist?

W7ZGA/VO2 thinks more publicity should be given to the contest. "Many stations had no knowledge of what kind of a report to send." Its not the publicity Jim, take a look at the returns from Europe and Japan. Its just that some of our guys don't want to be disturbed from their gossipy round tables.

W5JDX/VP9 wants scores of previous year published, to have a goal to shoot for. You're not reading the right magazine Roy.

The lone entry from Ireland wants to eliminate

W4GFB/KH6—L. to R. W7UXP, W4GFB and W3WDI, responsible for that consistant signal out of Hawaii.

log keeping or provide a stenographer for each station.

This was the first contest for DU1MP and he was thrilled with the excitement of a contest and the new stuff he worked. Mar sent us a nice clean log and had it all figured out. (Note from Ben, "Voltaire please take note, it was *all* figured out!")

VR2DS ran up a nice score this year because he had planned well in advance. "The XYL and harmonics were well advised of the coming contest, bribes were handed out and promises of better things afterwards." Hope it didn't cost you to much Pete.

Not enough power was KC6BK's excuse for not having a higher score. I don't think power would have made a bit of difference Stan, what you need is less distraction. Those of you who have received his QSL card will understand what I mean. Hi!

PY2QT's big problem was getting his log in. Mail service is so poor down his way that he had to send it via a friend who was making a trip to the States.

The gang at 4U1ITU didn't have any antennas for the lower bands so missed all the 80 meter activity in Europe. Some of you guys took extra credit for 4U1. No good, it still only counts as Switzerland.

GM3BCL thoroughly enjoyed his 16th *CQ* Contest. By golly I didn't realize we've been running these shindigs that long.

And PY3AHJ is sorry that there is only one *CQ* Contest each year. Are you kidding Doc, we barely recover from the last one before a new one is on top of us. And they keep growing bigger each year.

Returns this year showed a substantial increase, 658 logs as compared to 576, although the country total dropped to 102 from 111 last year.

As in the past we are again very generous in the distribution of awards and 256 certificates will be sent to the deserving winners.

Next month, the C.W. Results, (we hope). Those muffled groans from W1GYE and W2JB indicate that the load is almost twice as heavy as previous. But Andy and Ben are old hands and we'll manage somehow.

73 for now, Frank, W1WY

Top Ten

ALL BAND—SINGLE OPERATOR

	XT2Z . . . 647,836		
HC1DC	426,972	5A1TW	234,624
KP4CK	390,648	HK1QQ	225,106
5N2JKO	307,461	K5MDX	208,517
ZL1AIX	302,267	W1ONK	207,540
	VR2DS . . . 207,393		

Top Five

MULTI-OPERATOR SINGLE TRANSMITTER

	CX2CO . . . 991,728		
DJ1ZG/M1 .	429,111	DL1JW	282,100
DJ3VM	345,486	CT1YE	260,064

Top Five

MULTI-OPERATOR MULTI-TRANSMITTER

	W3MSK . . . 547,768		
DLØWW	361,616	K6EVR	255,744
OH5SM	305,545	GB2SM	198,449

Continental Leaders
SINGLE BAND

28 Mc		**14 Mc**	
LU1DAB . . .	120,984	**MP4BBW**	**203,700**
5A5TW	19,404	KA2JL	199,836
K5ORH	8,950	VR3O	162,475
I1TDJ	4,746	PY4AS	161,952
JA1HGY . . .	288	UC2AA	154,008
		ZE4JO	144,592
		XE1AE	79,222
21 Mc		**7 Mc**	
G3FXB	80,940	W3PHL	7,379
9G1YL	72,324	JA1DRQ	4,500
PY3AHJ	53,618	OK2KOJ	1,066
K9ECE	25,110	**3.8 Mc**	
AP2MR	22,563	ON4UN	13,068
DU1MR	21,546	I1AIM	12,980
		W1BU	3,162

U. S. A.

Leaders and Runners-up

All Band	K3UDX	204,820
28 Mc	K5SBN	8,134
21 Mc	W6BSY	14,575
14 Mc	K2HFX	78,780
7 Mc	K2GXI	7,065

Number groups after call letters denote the following: Band (A-all), Final Score, Number of QSOs, Zones and Countries. Certificate winners are listed in **bold face.**

Phone Results

SINGLE OPERATOR

North America

United States

W1ONK	**A**	**207,540**	**353**	**70**	**140**
W1WY	"	17,724	84	33	51
K1IMD	"	4646	40	19	27
W1NTH	"	3666	35	14	25
W1PLJ	"	1056	18	9	13
W1PIV	**14**	**49,285**	**187**	**29**	**66**
K1RTB	"	42,282	197	26	61
W1ZFV	"	30,942	135	26	55
K1OSY	"	24,495	129	20	51
W1BU	**3.8**	**3162**	**39**	**12**	**22**
W2TVR	**A**	**97,696**	**218**	**64**	**108**
WA2SFP . .	"	90,592	225	49	100
K2SUX	"	57,672	194	38	70
W2VCZ	"	41,412	142	44	75
W2GNQ	"	30,199	113	34	67
W2QKJ	"	18,504	97	25	47
W2GKZ	"	4850	43	21	29
WA2QNW . .	"	3870	44	23	25
K2ANR	**28**	**3636**	**42**	**13**	**23**
K2KXW	21	966	18	11	12
W2JKH	"	851	16	9	14
WA2BXK . .	"	416	9	7	9
K2HFX	**14**	**78,780**	**288**	**30**	**71**
K2IEG	"	46,372	163	26	72
W2BOK	"	34,080	154	24	56
WA2HOK . .	"	30,378	139	27	56
W2GBC	"	27,634	121	30	52
K2EHS	"	2822	33	15	19
K2GXI	**7**	**7065**	**64**	**15**	**30**
K3UDX	**A**	**204,820**	**361**	**75**	**134**
W3TLN	"	141,149	277	68	123
W3OCU	"	84,560	212	54	97
W3FDH	"	23,868	90	40	62
W3EGD	**28**	**5240**	**48**	**16**	**24**
W3AYD	**14**	**24,080**	**114**	**24**	**56**
W3TBF	"	15,120	96	23	40
K3JZH	"	6136	46	20	32
W3AKG	"	1736	22	13	18
W3PHL	**7**	**7379**	**68**	**15**	**32**
W4BVV	**A**	**165,137**	**286**	**76**	**141**
W4KWY	**A**	**52,272**	**147**	**49**	**83**
W4BCV	"	48,708	190	29	70
W4OM	"	30,498	114	35	68
W4ZYS	"	29,400	112	36	64
WA4DCP . .	"	28,034	115	40	67
K4ASU	"	22,704	102	29	57
W4QVJ	"	18,240	88	25	51
W4DQS	"	13,056	76	28	40
W4NJF	"	12,744	66	25	47
W4ZYQ	"	12,000	62	28	47
W4LRN	"	9238	59	26	36
WA4DQM . .	"	8400	57	26	34
W4EEU	"	8260	52	23	36
K4ORQ	"	7581	55	22	35
W4HVU	"	6136	43	27	32
K4RQE	"	464	11	7	9
K4QWM	**28**	**5076**	**49**	**16**	**33**
W4RLS	"	2520	35	14	21
K4WNA	**21**	**2652**	**43**	**12**	**26**
W5INL/4 . .	"	1475	27	10	15
W4DPN	"	792	14	9	13
W4EEO	"	450	10	6	9
W4AZK	**14**	**42,594**	**167**	**28**	**65**
W4AVY	"	15,246	91	22	41
W4QD	"	9860	62	19	39
K4TEA	3.5	297	10	5	6
K5MDX	**A**	**208,517**	**349**	**81**	**150**
W5WLD	"	43,318	148	45	76
W5JWM	"	32,186	105	46	75
W5SU	"	1884	38	21	28
K5ORH	**28**	**8950**	**71**	**14**	**36**
K5SBN	"	8134	70	16	33
K5SEK	"	2077	27	13	18
K5FFO	"	406	15	7	7
W5AJY	**21**	**12,998**	**75**	**22**	**45**
K5UYF	"	11,685	86	17	40
K5FKD	"	9435	75	18	33
W5DQK	"	9072	64	16	38
W5LDH	"	2904	35	13	21
W5KFT	**14**	**26,240**	**152**	**23**	**47**
W5KC	"	24,160	121	27	53
K6CTV	**A**	**121,380**	**267**	**61**	**109**
W6FYM	"	44,286	145	50	71
K6ERV	"	41,376	161	35	61
W6RCD	"	33,232	104	59	75
W6GRX	"	17,160	92	24	42
WA6GFY . .	"	16,125	82	31	44
W6SUD	"	966	19	9	14
WB6AZI . .	"	308	10	7	7
K6CT	**28**	**6720**	**70**	**16**	**24**
W6BSY	**21**	**14,575**	**102**	**17**	**36**
W6HJT	"	13,524	101	19	30
W6KPR	"	7611	63	15	28
W6SIA	"	5880	53	14	28
WA6EYP . .	"	4680	50	15	25
W6PQW	**14**	**18,616**	**125**	**18**	**34**
K6LAS	"	10,152	66	22	32
WA6KPB . .	"	7340	60	16	26
W6TMX	"	4191	45	13	20
K6AHV	**7**	**1349**	**34**	**13**	**16**
K7QCA	**A**	**40,560**	**132**	**47**	**73**
W7DQM	"	32,928	132	39	57
W7BTH	"	10,878	73	19	39
W7PQE	"	5844	62	10	18
W7IEU	"	780	18	15	15
W7DIS	**28**	**1334**	**29**	**10**	**13**
K4LYG/7 . .	**21**	**5535**	**49**	**15**	**30**
W7DLR	14	1650	21	13	17
K8YBU	**A**	**34,946**	**133**	**38**	**63**
W8JIN	"	25,887	100	48	65
W8WT	"	6844	50	25	33
K9EAB	**A**	**96,720**	**212**	**72**	**114**
W9NZM	"	92,444	199	72	119
W9JJV	"	16,643	77	36	53
W9SZR	"	693	14	11	10
W9LKI	**28**	**2314**	**37**	**10**	**16**
K9ECE	**21**	**25,110**	**120**	**22**	**59**
W9SFR	"	7200	57	23	37
K9DWG	14	192	7	6	6
WØLLB	**A**	**34,020**	**113**	**49**	**77**
WØBTD	"	33,439	108	47	72
WØCMB	"	17,108	78	38	53
KØLND	**28**	**3135**	**37**	**11**	**22**
WØAGX	"	945	16	9	12
WØNFA	**14**	**22,515**	**111**	**29**	**49**
KØMIC	"	8624	67	20	29
WAØAHL . .	"	2175	38	12	17
KØMQS	**7**	**2146**	**41**	**11**	**18**

Bahamas

VP7CU	**A**	**9635**	**227**	**23**	**18**
VP7CS	**21**	**11,544**	**237**	**11**	**13**

Bermuda

W5JDX/VP9	A	52,668	381	30	36
WØAIH/VP9	21	275	23	7	8

Canada

VE2AMW	14	3937	54	12	19
VE3PV	A	18,732	105	37	47
VE3ES	"	4767	65	31	41
VE3CBY	21	18,060	130	19	41
VE3BMB	"	3640	37	14	26
VE3CYE	"	1425	22	9	16
VE3EBU	14	5180	89	12	16
VE6TF	A	45,017	369	28	31
VE7EH	A	39,150	219	33	42
W7ZGA/VO2	14	22,393	202	16	33

Costa Rica

TI2JR	21	930	47	6	4

Dominican Rep.

HI8MMN	A	19,800	210	22	23

Greenland

KG1BO	14	5508	64	14	22

Mexico

XE1AE	14	79,222	581	22	41

Panama

HP1AC	A	6600	62	18	26

Puerto Rico

KP4CK	A	390,648	1109	64	100
KP4AVQ	"	146,778	681	40	62
KP4BBN	"	37,620	221	32	44
W1GXD/KP4	14	1496	67	5	6
KP4ASK	7	3703	78	8	15

St. Vincent

VP2SY	A	18,192	168	19	29

Sint Maarten

PJ5MC	A	87,040	666	30	34

Africa

Congo Republic

TN8AA	21	4464	53	15	33

Ethiopia

ET3LM	14	8550	72	21	29

Ghana

9G1YL	21	72,324	260	25	73

Libya

5A1TW	A	234,624	429	50	142
5A2TS	"	171,200	403	32	118
5A5TW	28	19,404	144	16	33
5A5TY	21	43,632	220	18	54

Madeira Is.

CT3AV	A	21,024	97	28	49

Mauritius

VQ8AM	A	3524	29	16	28

Morocco

CN8IU	A	109,632	390	27	69
W8CAU/CN8	14	52,836	246	22	52
CN8AW	"	23,128	141	16	40

Nigeria

5N2JKO	A	307,461	490	64	167
5N2RSB	21	22,836	124	21	45
5N2HJA	14	29,036	163	22	39

Rhodesia, No.

VQ2MS	A	54,827	194	37	72
VQ2KF	A	18,280	98	21	45
VQ2JG	"	8580	70	24	42
VQ2EZ	21	10,290	97	13	29

Rhodesia, So.

ZE1JE	A	133,920	303	52	108
ZE7JV	A	77,616	206	51	96
ZE4JO	14	144,592	441	34	78

South Africa

ZS5JM	14	122,385	345	36	87
ZS4U	"	77,436	253	30	78
ZS4MG	"	37,840	158	29	59

Voltaic Republic

XT2Z	A	647,836	967	72	166

Asia

Aden

VS9AAA	A	51,156	190	35	81

Bahrain Is.

MP4BDC	A	31,040	132	32	65
MP4BBW	14	203,700	528	37	103

Burma

XZ2DW	A	4550	53	21	29

Cyprus

5B4WS	A	75,428	239	30	79

Hong Kong

VS6EC	14	2556	38	13	23

India

VU2BK	A	54,054	180	37	80
VU2NR	14	90,797	318	30	79
VU2AJ	"	1962	37	12	20

Israel

4X4FV	A	207,083	450	41	116
4X4JA	"	12,921	79	15	44
4X4MJ	"	2496	26	11	21
4X4HM	28	240	10	4	4

Japan

JA1BWA	A	60,320	208	48	68
JA7AD	A	21,888	119	32	44
JA1CIB	"	8134	81	20	29
JA3BEA	"	7980	60	23	34
JA4AS	"	7125	56	22	35
JA1BUI	"	4032	49	16	26
JA7RH	"	2688	39	12	16
JA1BLS	"	1858	26	11	16
JA3AVO	"	1488	30	10	14
JA4FM	"	992	20	10	14
JA1EM	"	989	20	10	13
JA1FQE	"	416	14	7	9
JA1HGY	28	288	10	8	8
JA1CWP	21	16,875	138	18	27
JA7UJ	21	15,012	107	24	30
JA1FSL	21	14,500	111	20	30
JA6NP	"	11,628	97	18	28
JA6BOL	"	10,229	76	25	28
JA3BOY	"	6160	69	13	22
JA1ADD	"	5202	60	16	18
JA1CYV	"	3990	44	16	22
JA1JAN	"	2910	38	11	19
JA6PY	"	2706	35	15	18
JA3EBE	"	2052	32	11	16
JA3EBJ	"	1863	33	13	14
JA6AZQ	"	1593	27	13	14
JA4AQR	"	1560	29	12	14
JA3CEJ	"	990	20	10	12
JA7AZL	"	950	21	8	11
JA3BBG	"	665	16	9	10
JA2BYW	"	512	13	7	9
JA9UU	"	416	13	5	8
JA1JHF	"	352	11	7	9
JA1EHA	"	292	10	8	9
JA4AKL	"	221	9	6	7
JA6YBR	"	182	10	6	7
JA6AKV	"	126	7	4	5
JA1EFE	"	72	6	3	5
JA1DDC	"	63	5	3	4
JA1IZ	"	54	5	3	3
JA1WA	"	35	4	3	4
JA3UI	14	42,375	210	26	49
JA1ANA	14	35,186	181	26	47
JA1BLV	"	17,476	103	25	43
JA2ANX	"	5945	69	15	26
JA1BLC	"	5904	61	17	31
JA1CFN	"	3838	44	13	25
JA3CUK	"	3444	36	19	23
JA3ART	"	1824	28	12	20
JA8BI/1	"	1800	32	13	17
JA1EJK	"	1564	39	9	14
JA1BNW	"	390	13	5	10
JA1ALX	"	374	13	7	10
JA1AJA	"	350	14	6	8
JA7JH	"	108	6	4	5
JA8FO	"	90	5	4	5
JA1BEE	"	48	5	4	4
JA1DRQ	7	4500	57	13	17
JA2BAY	"	2000	39	9	11
KA2JL	14	199,836	643	36	81

Malaya

9M2GF	21	1953	86	9	12
9M2GJ	"	768	37	7	9

Pakistan (East)

AP5CP	14	130	10	6	7

Louis Kaiser at his home station 9G1DP. Louis took his camera along on his DXpedition to XT2Z but he was too busy running up a world high score to take time out for pictures.

Jim Lazenby at the operating position of KA2JL, the big signal from Japan, 2nd world high on 14 mc.

EA4GR—Poli del Valle and his 400 watter of European design. Poli is a consistant winner in our phone contests.

OHØNI — Sigurd Mansneros. Aland island is a nice catch in any contest. "Sigge" is always at the top of the list, alphabetically that is.

VP2SY—Washington Emmanuel and his modest little station that put St. Vincent on the map. Good work Washington, we could use a lot more like you down Caribbean way.

LX3QT—Walt did not indicate if this was the lay-out at the DXpedition location or his home at DJ6QT.

Pakistan (West)

AP2MR	21	22,563	160	23	46

Ryukyu Is.

KR6LJ	A	18,152	120	22	40
KR6BY	14	312	15	5	7
KR6PS	21	14,357	186	20	29

Saudi Arabia

HZ1AB	14	20,735	131	15	40

U.S.S.R.

Asiatic

UA9CH	A	5980	81	15	37
UA9VH	"	740	43	7	7
UA9TE	14	33,132	186	16	50
UW9CC	"	16,092	119	14	40
UA9KWS	"	2975	43	8	17

Azerbaijan

UD6BR	A	35,175	177	23	52

Kazakh

UL7JA	A	11,040	96	23	37

Kirghiz

UM8FZ	14	15,248	102	18	43
UM8KAB	"	7360	71	14	30

Turkoman

UH8BO	A	490	19	6	8

Uzbek

UI8LB	A	7175	67	14	27
UI8AG	14	23,246	153	18	41

Europe

Aland Is.

OHØNI	A	2145	55	9	30

Austria

OE1UA	A	8468	77	24	49
OE1RZ	14	55,002	265	30	73

Belgium

ON4SZ	21	57,100	218	27	73
ON5KY	"	17,496	99	21	51
ON4UN	3.8	13,068	275	8	36

Bulgaria

LZ2KKZ	A	10,164	116	21	45
LZ1UF	28	96	16	1	5
SP5AHO/LZ	21	5016	91	10	28

Czechoslovakia

OK2QU	A	18,468	143	24	52
OK1JX	"	11,985	137	18	67
OK1MP	"	11,700	103	23	67
OK3EA	"	10,752	117	19	45
OK1ADP	"	6930	107	12	43
OK1AFB	"	4176	77	13	35
OK3DG	21	11,700	118	13	37
OK1PG	"	63	4	3	4
OK3IT	14	12,200	186	12	38
OK3IR	"	2871	72	6	27
OK3YE	"	714	43	4	13
OK2ABU	"	406	22	4	10
OK1ABP	"	340	17	5	12
OK3CDP	"	72	8	4	6
OK2KOJ	7	1066	39	5	21
OK2SG	3.8	624	39	2	14
OK2BDB	"	168	14	2	10

Denmark

OZ4RT	A	36,790	213	34	96
OZ3KE	"	2604	57	11	31
OZ9QM	14	12,600	146	24	45
OZ8KR	3.8	154	14	2	9

England

G5ZT	A	48,760	255	30	85
G3MEA	"	41,886	193	37	80
G3NFV	"	37,376	231	33	95
G2NH	"	3685	62	12	43
G3MWZ	"	1408	36	10	22
G3JKY	"	1160	28	9	20
G5HZ	28	3032	40	10	17
G3FXB	21	80,940	322	23	72
G3OPJ	"	15,732	108	20	49
G3NNT	14	136,416	501	31	81
G2AJB	"	3276	80	7	29
G3NSY	"	3210	101	6	24

Finland

OH2TJ	A	50,673	317	31	102
OH5OQ	"	14,144	197	15	53
OH3NE	"	1144	52	5	17
OH2EW	21	1120	50	5	15
OH8OS	"	928	18	3	13
OH3NS	14	5226	124	7	32
OH3PC	"	3572	67	14	24
OH5RZ	"	3267	101	5	22
OH3NY	"	1382	58	3	21
OH2TI	"	140	17	2	8
OH2IG	"	88	8	3	8
OH1VA	7	437	22	4	15

France

F8WE	A	26,985	203	27	78
F3FA	"	26,160	137	29	51
F3PK	"	23,520	132	30	75
F3NW	"	18,286	159	22	60
F8TM	"	5684	71	20	38
F9OE	14	3239	60	11	30
F7DB	A	101,661	425	39	102
F7BI	"	25,432	147	27	61

Germany

DJ4WN	A	80,850	250	52	113
DL9OH	A	76,176	245	51	133
DJ2BW	A	71,827	220	46	113
DJ3KR	"	49,518	172	41	90
DL9CTA	"	46,400	190	39	77
DJ3WE	"	27,839	175	28	69
DJ5BV	"	24,284	168	28	79
DM3KBM	"	23,180	220	14	81
DJ5VQ	"	14,774	127	23	66
DJ5LA	"	14,181	101	24	63
DL7DF	"	10,080	77	25	59
DJ2WN	"	9633	84	20	37
DL9JL	"	7670	78	19	46
DL9KP	"	6984	61	21	51
DJ2MG	"	6322	58	20	38
DJ2UU	"	5460	90	14	51
DL7BQ	"	3696	54	20	36
DL6EN	"	3330	37	18	27
DJ2JA	"	2880	44	14	34
DJ1UE	"	2288	43	10	34
DJ3OJ	"	72	10	6	9
DJ2YA	21	7520	78	14	33
DJ6LV	"	6298	60	14	33
DJ2DG	"	1593	31	11	16
DJ3CP	14	9660	66	22	47
DL5GP	"	2739	60	8	25
DJ2YS	"	2442	64	6	27
DJ2RE	"	1265	37	6	17
DL1OW	"	425	21	7	10
DM2BEL	"	144	8	5	7
DJ2KS	7	330	17	4	11
DL1IN	3.5	676	24	5	21
DL4FT	A	17,014	132	29	65
DL2PO	21	6165	75	15	30
DL4BV	21	3132	40	11	25
DJØGT	14	49,368	258	25	63
DL4RX	"	8580	110	11	41

Greece

SVØWB	14	7110	132	14	31
SVØWL	"	1701	52	6	21

Hungary

HA1KSA	A	14,040	131	24	54

Ireland

EI8P	A	105,432	418	41	97

Italy

I1WSG	A	10,676	75	29	39
I1TDJ	28	4746	44	14	28
I1TDX	"	4644	54	14	29
I1SXN	21	638	17	5	12
I1AMU	14	50,688	311	28	71
I1ZIE	"	22,184	285	14	45
I1NAL	"	6118	107	10	36
I1LCF	"	2288	77	5	21
I1DFG	"	2080	79	5	21
I1PHN	"	1575	60	5	20
I1AIM	3.8	12,980	291	6	38

Netherlands

PAØWQ	A	45,890	223	38	92
PAØHSJ	"	6649	95	18	43
PAØUC	21	4386	50	15	28
PAØGMU	"	2376	46	10	17
PAØQT	"	1300	24	9	17
PAØHBO	14	44,100	213	29	71
PAØWWP	"	17,876	109	22	60
PAØSNG	"	12,460	106	19	51

Norway

LA5HE	A	36,279	146	40	99
LA6U	"	550	22	7	15
LA8WF	14	14,272	143	16	48
LA1KI	"	1092	53	4	17

Poland

SP5XM	**A**	**83,160**	**331**	**42**	**126**
SP5WC	"	2077	41	9	22
SP9RF	**21**	**15,309**	**123**	**20**	**43**
SP5ZA	"	1080	25	7	13
SP5AIB	"	480	21	5	10
SP9FR	**14**	**37,293**	**242**	**27**	**66**
SP5BT	"	11,024	158	13	39
SP9PZD	"	3737	87	7	30
SP5AHZ	"	2320	72	5	24
SP9ADU	"	779	38	4	15

Portugal

CT1JV	**A**	**48,870**	**246**	**38**	**97**
CT1LE	"	10,140	121	18	47
CT1LN	"	8176	107	15	41
CT1KH	"	7897	139	13	40
CT1QF	**21**	**23,688**	**204**	**18**	**54**
CT1PK	"	13,390	98	20	45

Roumania

YO7KAJ	**A**	**26,522**	**212**	**28**	**63**
YO3ZA	**14**	**3534**	**109**	**7**	**24**

Scotland

GM3BCL	**A**	**38,912**	**190**	**39**	**89**
GM3NQB	"	4465	100	10	37
GM3JDR	**14**	**24,414**	**215**	**23**	**55**

Sicily

IT1TAI	**A**	**17,640**	**155**	**24**	**66**

Spain

EA4GR	**A**	**82,810**	**299**	**46**	**123**
EA7HZ	"	23,232	168	29	67
EA3KT	"	19,584	158	27	67
EA3LA	"	5550	93	13	37
EA4EP	**28**	**3321**	**41**	**14**	**27**
EA3LS	21	450	12	8	10
EA4GZ	**14**	**63,990**	**419**	**23**	**56**

Sweden

SM3BIZ	**A**	**84,075**	**333**	**46**	**131**
SM2ALU	"	10,614	165	11	50
SM5CAK	"	10,502	162	12	50
SM7AIA	"	4646	59	17	28
SM5CEU	"	3848	73	15	37
SM7CRW	"	1711	60	7	22
SM5BDS	"	1178	31	10	21
SM5BFR	"	225	10	6	9
SM5CZQ	28	144	6	4	5
SM5BFE	**21**	**4554**	**128**	**14**	**32**
SM5BLA	**14**	**69,721**	**372**	**36**	**77**
SM5ANH	**14**	**23,236**	**219**	**22**	**52**
SM5BGB	"	8532	122	14	40
SM5BOU	"	5640	129	8	32
SM3CNN	"	2987	93	6	23
SM6AOQ	"	2160	64	7	23
SM7ACB	"	1682	49	7	22
SM5KV	"	189	21	2	7
SM5BKM	"	182	14	3	10
SM3AZI	**3.8**	**1653**	**55**	**4**	**25**
SM5BPJ	"	1100	49	3	19

Switzerland

HB9ZY	**A**	**165,852**	**346**	**59**	**145**
HB9MO	**A**	**39,000**	**225**	**30**	**100**
HB9HK	"	34,709	231	21	40
HB9UD	"	10,868	104	21	55
HB9EU	"	7560	75	22	48
HB9MQ	"	2870	54	11	24
HB9J	"	2346	35	13	21
HB9UL	"	1632	26	12	22
HB9EC	"	591	43	9	11
HB9QA	"	169	10	5	8

Yugoslavia

YU3OV	**A**	**33,984**	**227**	**32**	**86**
YU1AHI	"	11,644	142	14	57

U.S.S.R. European

UA3UJ	**A**	**33,376**	**220**	**27**	**85**
UA4IF	"	32,178	185	28	65
UA4HP	"	6264	91	13	41
UA6LI	"	3616	101	7	25
UA6BN	"	3510	80	4	27
UA6BP	"	792	24	7	15
UA4PA	**21**	**8977**	**90**	**13**	**34**
UW3UF	**14**	**34,580**	**228**	**25**	**66**
UA6MK	"	19,334	198	17	54
UA4PW	"	13,826	157	16	46
UA1MU	"	10,248	127	16	45
UA3XS	"	1708	60	5	23
UA1CC	"	1486	41	8	20
UA1OE	"	864	30	6	18

Estonia

UR2AR	**14**	**37,142**	**231**	**30**	**68**

MP4BBW, Ian Cable came out on top in a scrap with KA2JL for 14 mc world high.

UR2GT	28	216	8	6	6
UR2AO	**3.8**	**3164**	**118**	**3**	**25**

Latvia

UQ2AN	**A**	**16,948**	**180**	**17**	**59**

Lithuania

UP2AN	**A**	**20,790**	**241**	**15**	**55**
UP2CG	**3.8**	**3630**	**110**	**4**	**29**

Moldavia

UO5SA	**14**	**8624**	**174**	**11**	**33**

Ukraine

UB5UN	**A**	**107,100**	**442**	**47**	**133**
UT5GP	**28**	**544**	**20**	**6**	**11**
UB5DHH	"	308	18	5	9
UB5BFS	"	48	6	2	4
UB5LV	**21**	**38,016**	**237**	**26**	**70**
UB5FG	21	20,033	213	16	51
UB5KCA	**14**	**4258**	**106**	**7**	**25**
UB5VH	"	1176	51	5	16
UB5KAK	"	432	17	5	11
UB5DT	"	425	21	5	12
UB5KEL	"	198	12	4	7
UB5ANB	3.8	558	33	3	15

White Russia

UC2AA	**14**	**154,008**	**556**	**38**	**100**

Oceania

Australia

VK2RA	A	550	15	10	12
VK2APK	**21**	**5170**	**84**	**9**	**13**
VK4XJ	14	744	17	9	15

Caroline Is. (East)

KC6BK	**14**	**66,978**	**311**	**29**	**57**

Christmas Is.

VR3O	**14**	**162,475**	**611**	**31**	**66**

Cook Islands

ZK1BS	**A**	**177,216**	**469**	**58**	**84**
ZK1AR	"	42,129	181	40	53

Fiji Islands

VR2DS	**A**	**207,393**	**643**	**45**	**78**

Guam Island

W6CBE/KG6	**A**	**16,815**	**117**	**22**	**35**
KG6ALD	**14**	**103,356**	**366**	**33**	**75**
KG6AJB	"	69,195	256	33	72

Hawaii

KH6EVT	**A**	**134,862**	**397**	**54**	**79**
KH6EKR	"	85,280	384	32	48
KH6EKO	**14**	**74,732**	**400**	**24**	**44**
KH6CKO	"	21,291	186	17	30

New Zealand

ZL1AIX	**A**	**302,267**	**581**	**73**	**130**
ZL1AAS	**14**	**62,566**	**274**	**27**	**55**
ZL1AGO	"	47,874	226	29	50
ZL2AYE	"	8632	75	20	32

Philippines

DU7SV	**A**	**44,872**	**242**	**27**	**44**
DU1MR	**21**	**21,546**	**165**	**15**	**27**

South America

Argentina

LU7DGM	**A**	**24,080**	**136**	**32**	**38**
LU1DAB	**28**	**120,984**	**584**	**22**	**49**
LU3EQ	**14**	**12,714**	**117**	**18**	**21**
LU8FAO	"	6650	69	17	18

Brazil

PY2QT	**A**	**171,284**	**612**	**60**	**112**
PY3APH	28	112	6	4	2
PY3AHJ	**21**	**53,618**	**232**	**25**	**58**
PY1ATR	"	5544	55	16	28
PY4OD	"	1798	27	11	18
PY1BWF	"	585	20	7	8
PY4AS	**14**	**161,952**	**587**	**26**	**70**
PY2BZD	"	204	16	5	7

Chile

CE4BP	**A**	**39,510**	**166**	**34**	**56**
CE1AD	"	26,163	168	26	31
CE3VU	**14**	**65,376**	**330**	**50**	**72**

Columbia

HK1QQ	**A**	**225,106**	**767**	**45**	**53**
HK3EY	"	33,600	161	35	45
HK3LX	"	25,416	236	18	18
HK3RQ	"	23,564	118	39	47

Ecuador

HC1DC	**A**	**426,972**	**923**	**64**	**97**

Netherlands, W. I.

PJ2CR	**A**	**39,658**	**184**	**30**	**49**

Paraguay

ZP5CG	**A**	**27,000**	**163**	**32**	**48**

Peru

OA1W	**A**	**25,728**	**130**	**29**	**38**
OA4BS	**21**	**3003**	**46**	**13**	**20**

Uruguay

CX3BH	**A**	**31,132**	**141**	**34**	**52**
CX2CN	"	25,662	142	32	46
CX2RE	"	17,472	105	37	47
CX6AR	"	8395	67	34	39
CX9AW	"	1776	33	18	19
CX1RY	"	783	30	13	16
CX4OA	"	500	16	12	13
CX8BE	**21**	**2048**	**40**	**12**	**20**
CX2AY	**14**	**58,776**	**340**	**23**	**39**

Venezuela

YV5AGD	**A**	**49,858**	**210**	**40**	**57**
YV5AMH	"	33,570	262	22	23
YV3BW	"	22,477	95	36	55
YV5AKP	"	480	11	6	10
YV5AKU	"	315	8	7	8
YV5AHG	**21**	**31,119**	**268**	**15**	**26**
YV1EE	**14**	**66,240**	**350**	**21**	**43**
YV1DP	"	46,472	422	14	23
YV5AVA	7	156	7	5	7

MULTI-OPERATOR Single Transmitter North America

United States

WB2CCO	**12,804**	**96**	**24**	**42**
		(K1BVI-WA2UJI)		
W4VZB	**61,375**	**185**	**49**	**76**
	(W4VZB, W4YWX, WA4AFP, K4WYF, K4ODI, K4HDQ)			
WA6EPQ	**95,964**	**256**	**50**	**82**
	(WA6EPQ, WA6IPY)			
WA6SBO	56,515	173	48	79
	(WA6SBO, WA6WVR)			
W8NGO	**87,522**	**195**	**62**	**112**
	(W8NGO, W8CLR, W8ONA)			
W9OKM	**15,228**	**82**	**34**	**47**
	(W9OKM, W9YYG)			
K9SFT	9648	68	30	37
	(K9SFT, W9FUV, W9KHG, K9VDB)			
WØEEE	**67,944**	**189**	**56**	**96**
	(KØLFY, KØIFL, KØUTX, KØVXU)			

Guadeloupe

FG7XT	**92,404**	**509**	**33**	**51**
	(FG7XT, FG7XR)			
FG7XS	46,089	204	28	53
	(FG7XS, FG7XP)			

[*Continued on page 87*]

DX DX DX DX DX

URBAN LE JEUNE, JR.*, W2DEC

The following certificates were issued between the period from February 7, 1963 to and including March 7, 1963:

CW-PHONE WAZ

1784	W2PBD	Edward H. Nadolny
1785	OZ9N	Robert Priess
1786	KW6DF	Leroy (Bob) La Baume
1787	KW6DG	Layne La Baume
1788	DJ1KR	Walter Venzke
1789	W4FZO	Michael Gray
1790	UA4PA	Oleg A. Safiullin

ALL-PHONE WAZ

192	WØTJ	W. M. Atkins
193	K5ICA	Kermit Kruger

TWO-WAY SSB

154	SM5MC	Stan A. Larsson
155	LA5HE	Ragnar Otterstad

CW WPX

420	K9BVR	Wallace Kays
421	W8WT	Lester A. Jeffery
422	G3NRZ	C. A. Hogg
423	UA9DR	Vladimir V. Volodin
424	CR7IZ	Rutilio Ferreira Graca
425	VE3ES	Jack H. McLeod
426	W2PDB	Edward H. Nadolny
427	G3KMQ	R. G. Heslop

PHONE WPX

85	W6USG	Paul Taylor Brogan
86	W1DGJ	Mike Ludkiewicz

SSB WPX

125	UA2AO	Anatoly M. Moskalenko
126	W1DGJ	Mike Ludkiewicz
127	VE3ES	Jack H. McLeod
128	UW9CC	L. I. Bulatov
129	W6DLY	Guy M. Martin, Jr.

MIXED WPX

65	W6USG	Paul Taylor Brogan
66	W9YSX	M. R. "Skip" Franke
67	OK3EA	Harry Cincura, M. D.

Here And There

CEØX San Felix: Florida DX Club's DXpedition to San Felix Island (CEØXA) will have to be postponed. No future date has been set. The big hold-up is the rental of a boat from Chile to San Felix (550 miles to the West) and back. One captain said his boat could be chartered for $10,000. Later, he bargained down to $8,000. The boat to Bajo Neuvo and Serrana Bank cost $1,000 but when split between a group of DXpeditioners, the cost wasn't so bad per person. But eight grand is a different story. Efforts are being made for a more (*much* more) reasonable rate. Meanwhile, the same group has something else cooking that may prove interesting. (*Tnx Fla. DX* Report)

HKØ San Andres: For some time now, the station of HKØAI, Victor Abrahams, on San Andres Island has been very quiet. The reason being that Victor's venerable S-40A, considerably repaired as best as possible with available materials, had about breathed its last. Under present crowded band conditions this fifteen-year old receiver almost prohibited any enjoyable operation, particularly after the hornet's nest started humming in response to hearing the call, HKØAI.

While on San Andres in May, and again in late November, 1962, some of the Florida DX Club members resolved that an attempt would be made to secure a modern receiver to enable Victor to operate again. Victor demonstrated that this was not to be a "one-way street" donation by accumulating $100 in American currency toward the muchly desired gear.

At the Tropical Hamboree, W9AC, Bill Halligan, president of Hallicrafters, most generously donated a prototype of the W9TO keyer to be used as a fund raiser toward the purchase of the receiver. This keyer was constructed by Jim Ricks, W9TO, personally, and definitely was not a production-line model. Truly a conversation piece as well as being a worthwhile addition to any shack.

At the Hamboree auction the bidding closed out at $46.00, the money added to the funds towards the purchase of a receiver.

The remaining necessary arrangements were completed by mid-week after the Hamboree and an SX-111 was shipped, via Air Express, to Victor on San Andres Island.

The Florida DX Club owes a sincere vote of gratitude to Mr. Halligan for his wonderful gesture and it was the pleasure of the Florida DX Club to add their modest efforts toward securing this much needed receiver for a deserving DXer.

*Box 35, Hazlet, New Jersey.

WPX HONOR ROLL

C.W. WPX

W2HMJ	668	W5LGG	502	DL1YA	450	W4DKP	410	W8WT	565	W5ERY	358	K4PUS	305	W8WT	588
W8KPL	632	W6YY	502	DL9KP	450	K4IEX	408	G3DO	565	W8JIN	356	W6YMV	304	K9EAB	578
W5KC	629	IT1AGA	502	W8JIN	448	W1CKU	408	W9YSQ	471	PY2CK	354	DJ3CP	304	W6YY	570
W2AIW	617	K2CPR	501	W9UZS	447	K4JVE	407	MP4BBW	454	5A5TO	353	K1IXG	303	W4BYU	557
W6KG	574	W9SFR	501	W8RQ	445	W5AFX	407	PAØHBO	453	W1ORV	351	K2TDI	300	W3AYD	552
W2EQS	572	W2EMW	500	W3AYD	443	W7HDL	405	W6YY	448	LA5HE	351	KØRDP	300	HB9EU	551
W4OPM	571	K2ZKU	500	OE1FF	442	W4YWX	404	G8KS	430	ZS6IW	350	WA2SFP	300	YU1AG	533
K6CQM	565	G2GM	499	W3BQA	437	GI3OQR	404	VK6RU	421			W3VSU	300	W2GT	528
W5OLG	564	K9EAB	497	LA5HE	437	ZS4MG	404	W3AYD	420			WØCVU	291	G8KS	520
W2NUT	550	W2MUM	495	W8UMR	429	K2ZRO	403	W9UZC	418			W4RLS	278	K9AGB	510
W9YSX	544	W1WLW	494	WØAUB	429	W9DYG	403	F8PI	418			K2JFV	266	W5LGG	509
W9UXO	542	SM5CCE	488	K5LIA	428	W9IHN	403	PZ1AX	413			K2MGE	263	K2ZKU	508
K2UKQ	535	W4BYU	487	W2RA	428	VE6VK	403	K9EAB	412			W3AYD	262	W9DWQ	508
W1EQ	528	ON4QX	486	OK1MB	428	K4TEA	402	K2CJN	409			W4EEU	262	W4BQY	505
W2HO	526	W8PQQ	481	W3CGS	426	WØVBQ	401	DL3TJ	404			W4NJF	260	W3KDP	501
DL1QT	518	W4HYW	478	W1EIO	425	IT1TAI	401	W1UOP	402			VE3BKL	259	W8UMR	500
K9AGB	515	W3OCU	466	SM5WI	424	VE3JZ	401	G3NUG	400			XE1CV	256	LA5HE	500
W1TJB	513	K6SXA	464	WØPGI	420	OE3WB	400	OE1FF	382			G3FKM	255	DL3RK	493
W6WO	511	W2KIR	463	HB9TT	419	SP4JF	400	SP7HX	381			UR2AR	255	JA2JW	480
W2GT	510	DJ2KS	462	G3HIW	418	SP6FZ	400	TG9AD	381			W6USG	252	WØMCX	476
SM7MS	510	PY4OD	462	W8IBX	416	VE1AE	400	DL6VM	376			TG9AD	252	W3CGS	475
W8LY	506	JA2JW	461	WØMCX	416	VE4OX	400	DJ3CP	375					W9FVU	474
W9DWQ	506	W9WCE	458	K2PFC	415	VK3KB	400	PAØSNG	369					G3FKM	463
W9GFF	503	W3BCY	457	W5AWT	412			G3FKM	366					DL1YA	456
G3EYN	503	OK3EA	456	W5DA	412			W8UMR	363					WØVBQ	452
YU1AG	503	DL3RK	454	K5LZO	411			SM3AZI	362					PAØLOU	452
		PAØLOU	451	WA2DIG	411			SM3EP	361					GI6TK	450
		W3PGB	450	W2PTD	411									HK3LX	450

Phone WPX

CT1PK	599	W9WHM	570												

S.S.B. WPX

MP4BBW	462	W4OPM	451	G3AWZ	428	HB9TL	423	W3NKM	402	K9EAB	401	G8KS	400	G3DO	373
G3NUG	356	TI2HP	356	W3MAC	354	PZ1AX	345	W2HXG	324	W2VCZ	320	W1UOP	318	W2YBO	318
W8PQQ	315	W1ORV	307												

Mixed WPX

W4OPM	629	W8JIN	605	G3DO	597	W3OCU	588								

The above account was taken from the Florida *DX Report* and the fellows are to be congratulated for the wonderful gesture. This, I think, is the true spirit of the DX Man.

IT1 Italy: Guis, IT1AGA, recently passed a milestone in his ham career. He had QSO #30,000. He has a WPX record of 534/511 and a DXCC record of 218/213. Awards number over 130. The thing that makes this even more remarkable is that his rig runs only 60 watts and his antenna is a windom.

KG6 Mariana Islands: The following letter to Joe, WA6TGY, should help clear some of the confusion on the Mariana situation:

"Well, I got some dope that you might be interested in. The full scoop on Rota is really hard to explain, but several people, including myself, have applied for a license with negative results. We've done just about everything to try and reason with them and so far no luck. They say that they will only issue licenses to residents of the Territory. The Commissioner of the Pacific Islands Trust Territory gave me the run around for more than four months before I finally got a 'no' out of him. They just keep passing the buck and don't want to be bothered even discussing it. And when confronted with the question they get most unpleasant! HI.

"W9WNV/HL9KH received permission to go over the islands as a doctor to the natives. He was a traveling resident, so to speak, hopping from island to island.

"Also, there is another possibility of getting another station on the air from Saipan—the one at the Coast Guard Station. This is a remote idea and if it does materialize, it won't be until May or June.

"There is an island about three miles off the southern tip of Guam that does not come under the government of Guam or the Trust Territory. It is ruled by the Navy and I have been trying to find out from the ARRL if they would possibly include that amongst the T. T.

"Transportation and facilities are easily available there and we could make the trip every weekend if we wanted to." K2QCC/KG6

Don, W9WNV, had approximately 5200 QSOs in 10 days of operation as W9WNV/KG6R. QSLs will be sent by W9VZP.

Clay, of XW8AS fame, is now licensed as KH6FBJ and periodically visits Saipan and holds the call KG6SX.

SP Poland: SP2CO is interested in swapping SP stamps for a call book.

WAZ and WPX

THE WAZ and WPX certificates are awarded by the *CQ* DX department. WAZ is issued for proof of contact with the 40 Zones of the world as shown on the official WAZ Zone Map. WAZ is issued in three classes, *i.e.* Any mode, all phone and all s.s.b. For complete rules, see the January, 1962 *CQ*, page 50.

WPX is issued in four classes, *i.e.*, all c.w., all phone, all s.s.b. and Mixed. The number of prefixes required are: C.w.-300: Phone-300; s.s.b.-200; Mixed-400. For complete rules, see January, 1962 *CQ*, page 52. WAZ applications, Zone Maps and WPX applications may be obtained from the DX Editor at the address shown at the head of this column. Please send a self-addressed, stamped envelope or a self-addressed envelope and an IRC. All applications should be sent directly to the DX Editor.

This neat and interesting station belongs to FG7XP. Daniel can be found on most phone bands. *(Tnx K2OLG).*

A "main road" (left) through Mozambique to Nyasaland. Mal, ZE3JO/ZD6JO, is in the foreground. A good indication of an exceptionally fine spot for hamming. The "X" marks the position of the 2nd rig used on the Nyasaland trip of ZE3JO and ZE3JJ. See text for the interesting results between the two stations. *(Tnx ZE3JO and ZE3JJ)*

VK6 Norfolk Island: The Australian Overseas Telecommunications Commission has closed its Norfolk Island cable station and Ray, VK9GP, has QRTed . . . This will relegate this spot to the rare category again. *(Tnx W9IRN)*

VS1FJ, Frank, is planning a DXpedition to Christmas Island, VK9. The DXpedition will be conducted by an RAF group and if the Kamaran operation can be used as a criterion it should be a good one. They have all the equipment, tents, power, food, etc. At the moment, they are awaiting action on their request for a license and visiting permit. If all goes well, they will spend two weeks trying to put this rare one in our logs. *(Tnx WGDXC)*

VS9M Maldives Islands: VS9MB can usually be found on 14102 kc s.s.b. every day at 1700 to 1730 GMT. *(Tnx LIDXA)*

4W1 Yemen: The plot thickens. Krim, 4W1AA, told K4OBM that his logs to W3CXX were returned by the censor and to QSL via his friends at Box 2928, Cairo. WA6EPQ says 4W1AA passed along his logs to SU1IM. SU1IM repeated the calls after 4W1AA passed them along in groups. (*Tnx Fla.* DX Report)

To my knowledge, no QSLs have been received from 4W1AA and it sounds like a ZA1GB fiasco; let's keep our collective fingers crossed.

The Maharj Kumar of Sikkim who is better known to DXers as AC3PT. The Prince recently married Hope Cooke, an American girl. The March issue of *National Geographic* contained a very interesting article on Sikkim. *(Tnx W3LE).*

160 Meters

February 21st was an exciting day, 160 meters was open! W3GQF and KP4AXU opened up KP4 on 1898 while K1KSH/4 and W1BB opened up Georgia. Many QSOs followed all over the USA, too numerous to mention.

FIRSTS—With 160 opening up, this has been a period of quite a few new firsts, of which we list the following known ones to date: *First*—HC1DC/DL1FF QSO Feb. 3; *First*—VR3G/East Coast QSO; Christmas Island, Oceania, 1997 kc with W2IU 1.8 kc Feb. 20. Followed by contacts next day with W1BB and W3GQF. Many thanks due W6KIP, Alex, who followed conditions and notified Martin's return from the hospital and resumption of 160 activities and QRXd to help. Martin/VR3O writes: "Alex is terrific! Without his help, very little of this would be possible. Would like to express my appreciation."; *First*—KM6/W 160 QSO ever, when Alex, W6KIP and KH6EGL/KM6 made a GO of it. Congratulations! *First*—Another first is recorded with receipt by W1BB of QSL for QSO with OY7ML Nov. 25, 1962. OY7ML/339, W1BB/339—OY7ML, now in Denmark, will return for 1964 season next fall and hopes to again get special permission. *First*— Still another first to CT1CO and W3GQF who contacted Feb. 24, followed by W1BB, 2IU, FYT, EQS, K1FIR and W2UWD in that order. CT1CO also heard 1ME, TX, WY, PPN, 4DQS, K4HJJ. Congratulations to Manuel for putting CT on the 160 meter DX roster with this very splendid performance. Can anyone beat W3GQF's record this season of 43 DX stations in 22 countries and a total of 85 DX QSOs? (Counting repeat QSOs with DX stations) *First* VP5/G QSO when G3IGW worked VP5XG. *(Tnx W1BB)*

Trip to Nyasaland, ZD6

As told by Mal, ZE3JO

In 1959 and 1960, on our Nyasaland trips, the calls of ZE3JJ/ZD6 and ZE3JO/ZD6 were used; this trip however we were able to have ZD6JJ and ZD6JO calls issued to us for the period 13th to 22nd October, 1962.

After a pretty hectic and very dusty journey from Salisbury, Southern Rhodesia to Zomba, Nyasaland, we were on the air on the Sunday evening, operating from the Ku Chawe Hotel. This Hotel is actually on the Zomba Plateau, at an altitude of about 5250 feet. The transmitter was a Viking Ranger and the Receiver an Eddystone triple 8. One long wire antenna of about 700 feet was slung through the trees on the top of the ridge behind the hotel. It was used on 7, 14, and 28 mc bands, with a vertical dipole for 21 mc. By taking turns for the first three days we were quietly knocking off lots of contacts, mostly on c.w., with the odd phone QSO when conditions allowed.

After the first three days, ZD6GA and G3JCJ/ZD6, who were in Zomba, visited us and offered to lend us a Heathkit DX-4O, and a Marconi CR100. These were set up on the top of the highest peak on the plateau, at a height of approximately 7000 feet, the QTH being a new v.h.f. station, not yet in actual operation, but fortunately, having a.c. mains, the absolute necessity. It also had a 60 foot antenna mast, so in no time at all a long wire of unknown length was radiating.

The conditions at this second QTH were very much better in all respects than those at the hotel, but the snag was the time and discomfort it took to get there, about 45 minutes by car from the hotel.

With Ivan (ZD6JJ) operating at the hotel it was noticed that up top, stations could be worked practically all day while at the hotel he was having the odd USA or European station. When I was operating at the hotel I was sitting back listening to Ivan up top getting all around while I was getting practically nil at times. This, in spite of the good position at the hotel. At the top station forty meters gave us both many contacts, especially when the writer was on an all-night session during the Saturday and Sunday of the last weekend of the trip. In fact, conditions were so exceptionally good that on this particular morning, I actually had five contacts using my artificial leg as the antenna! The facts about this was that while either of us was at the top QTH the weather there was extremely cold, with high winds and mist, so that to combat this whoever was at the top station always took a half jack of brandy with him. This Sunday morning I had finished off my quota and having taken off the leg for comfort, I suddenly thought it a good idea to see if I could get a contact or two with the leg as an antenna. I connected the leg up to the transmitter with a one-foot piece of 5 amp fuse wire from the transmitter to one of the metal joints, tuned up and called CQ, having seen that a neon tube showed that it was loading quite successfully. My first call on 14 mc c.w. gave a QSO with a ZS station. Then I changed to 21 mc. Here I had contacts with ZS1, DL1, ON4 and a phone contact with Ivan at the hotel. Proof that the juice was in fact not "going up the spout," but "going up the leg"! I am now endeavoring to get a WAC with this portable antenna.

This attractive husband and wife team are Joan and Bob, KG6ALC and KG6ALD. Bob complains of local QRM from YA1AW, UM8FZ, KC6BK and 4S7YL. Joan and Bob will be pulling the big switch about the time you read this.

After having had about 1400 contacts between us, we finally closed down on the Monday, the 22nd October. Upon our return to Salisbury there were stacks of QSL cards for the ZD6 prefix.

The one point that both myself and Ivan noticed during this trip was that we had both been convinced that if the QTH is perfect one can then have all the contacts one wishes even in poor conditions, whereas, here in Salisbury, despite an altitude of 5000 feet above sea level, and a pretty good situation, things are not quite the same as those experienced on the Zomba Plateau.

We have both said that after this, our third trip to ZD6, it would be the last, due to the pretty awful roads for hundreds of miles through Mozambique and parts of Rhodesia. (Actually we said this in 1959 and again in 1960), so it looks as if we might have another trip next year after all.

QTH and QSL Managers

The QSL Bureaus for the Radio Society of East Africa have been recently listed improperly. The bureaus are as follows:

VQ4, Kenya	P. O. Box 30077, Nairobi, Kenya
VQ5/5X5, Uganda	P. O. Box 3433, Kampala, Uganda
VQ3/5H3/VQ1, Tanganyika	P. O. Box 2387, Dar-Es-Salaam, Tanganyika

The following letter from K2PFC is self explanatory and I think it is a very legitimate gripe.

"I've got a gripe and I get disgusted to see my envelopes coming from the K2/W2QSL Bureau loaded with stateside cards.

"I am the QSL Manager for Bing, 5A3BC, and, of course, expect the DX boys to use the Bureau. When we take on the DXer to help him with his QSL chores we assume and expect some cash to get cards answered for him. There is a Gentleman's Agreement that whenever possible a s.a.s.e. be enclosed with all stateside requests.

"Even if we QSL Managers replied via the Bureau we have to get out an envelope, write on the name and address, and use sufficient postage to get it there. Might I suggest that from now on if the stateside boys want replies they had better enclose s.a.s.e. or their cards go into the waste basket."

What say fellows? Let's show these QSL Man-

[*Continued on page 87*]

CONTEST CALENDAR

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

FRANK ANZALONE*, W1WY

CALENDAR OF EVENTS

April	27-28	PACC C.W.
May	4-5	*CQ* Spring V.H.F.
May	4-5	USSR DX
May	4-5	PACC Phone
May	11-12	Georgia Party
May	11-12	OZ CCA C.W.
May	18-19	OZ CCA Phone
May 31-June 3		CHC/HTH Party

P A C C

C.W.

Starts: 1200 GMT Saturday, April 27
Ends: 1800 GMT Sunday, April 28

Phone

Starts: 1200 GMT Saturday, May 4
Ends: 1800 GMT Sunday, May 5

Stations outside the Netherlands will try to see how many PA-stations they can work in this one. Complete rules and list of provinces in last month's CALENDAR.

Your logs go to: Mr. P.v.d. Berg, PAØVB, Contest Manager VERNON, Keizerstraat 54, Gouda, Netherlands.

CQ Spring V.H.F.

Starts: 1300 Local Time, Saturday, May 4
Ends: 1300 Local Time, Sunday, May 5

A complete new set of rules for this one, covered on page 32 of March *CQ*. Better check back and familiarize yourself.

USSR DX

Starts: 2100 GMT Saturday, May 4
Ends: 2100 GMT Sunday, May 5

This contest sponsored by the Radio Sports Federation of the USSR is a c.w. contest *only*. Logs are solicited for the entire 24 hour contest period but only contacts made over a continuous 12 hour period will count in the scoring. So pick out your best 12 hour stretch in figuring your score. This is a world wide type contest, same as our WW *CQ* DX, so don't concentrate on USSR stations only if you want to run up a good score.

1. Use all bands 3.5—28 mc.

2. Serial numbers will be of the customary six digit variety, RST plus a progressive QSO number starting with 001.

3. Each completed contact counts 1 point, and the same station can be worked once on each band.

4. The multiplier is determined by the number of different countries worked, *not* the sum total from each band. Contacts with your country are permitted for multiplier purposes, providing it's not a local contact. The DXCC country list will be used as the official list.

5. The final score therefore is the number of contact points multiplied by the number of different countries worked.

6. There are two classifications, single operator and multi-operator. In addition, single band entries will be accepted for the 3.5 mc band only.

7. Awards in the form of a certificate and a contest badge will be given to the five highest scoring single operator stations in each country. In the multi-operator classification a certificate will also be awarded to the five top stations in each country and in addition a badge to each operator on the winning station.

8. Your log should show in this order: Date & time in GMT; band; station worked; number received; number sent; QSO points and leave a blank column for the Jury's notes. I would suggest you add another column for the multiplier or check off each new country as it is worked.

Contest contacts can also be applied for any of the following awards without the necessity of submitting QSL cards.

The W 100 U for working 100 Soviet stations. (Five of which must be UA9s.)

The R 10 S for working all 10 Soviet call areas.

The R 15 R for working all 15 Soviet republics.

The R 150 S for working 150 different countries. (This list must include the 15 Soviet Republics.)

The R 6 K award for establishing contact with all six continents is now offered only for s.s.b. contacts and is of course not available in this c.w. only contest.

Logs should be mailed not later than May 15th and go to the Chief Judging Board, P. O. Box 88, Moscow, U.S.S.R.

Georgia Party

Starts: 1800 EST Saturday, May 11
Ends: 2400 EST Sunday, May 12

This is another one for the CHCers and Clif

[*Continued on page 90*]

*14 Sherwood Road, Stamford, Conn.

PROPAGATION

GEORGE JACOBS*, W3ASK

LAST MINUTE FORECAST

The following is a forecast of day-to-day propagation conditions expected during May, 1963. This forecast attempts to predict *specific* days upon which openings shown in the Propagation Charts in this column are most likely to occur, and the expected quality of the openings. For example, the following forecast shows that circuits rated (2) in the Propagation Charts are most likely to open with "good-to-fair" quality (B-C) when conditions are above normal (May 12, 16, 19, 23 and 27), and with "fair-to-poor" quality (C-D) when conditions are expected to be normal. Circuits rated (2) are not expected to open on those days forecast to be "disturbed," etc.

PREDICTED PROPAGATION CONDITIONS AND CIRCUIT QUALITY

Prep. Chart Forecast Rating	*Above Normal Days (WWV rating higher than 6)* May 12, 16, 19, 23 and 27	*Normal Days (WWV rating 5 or 6)* May 1-3, 5, 7-11, 13-15, 17-18, 20-22, 24-26, 28-29	*Below Normal Days (WWV rating 4)* May 4, 6, and 30	*Disturbed Days (WWV rating 3 or less)* May 31
(1)	C	D-E	E	E
(3)	B-C	C-D	D	E
(2)	A-B	B-C	C-D	D-E
(4)	A	A-B	C	D

Where:

A—An excellent opening with strong steady signals.
B—A good opening, moderately strong signals, with little fading and noise.
C—A fair opening, signals fluctuating between moderately strong and weak, with moderate fading and noise.
D—A poor opening, signals generally weak, with considerable fading and high noise level.
E—A very poor opening, or none at all.

EXCEPT for an occasional daytime opening to southern or tropical areas, very few DX openings are predicted for 10 meters during May. Frequent short-skip openings between distances of approximately 750 and 1400 miles should be possible during the month. DX openings on 15 meters are expected to occur on fewer days and to fewer areas of the world than during the winter and early spring months. Numerous short-skip openings between 600 and 1400 miles should take place as a result of increased sporadic-*E* propagation. During May, propagation conditions on 15 meters are expected to peak during the early afternoon hours. Twenty meters is forecast to be the best band for DX during May. The band should open shortly after sunrise, and good propagation conditions should prevail to one area of the world or another through the early evening hours. When propagation conditions are normal or better, the band may remain open to some southern and tropical areas during the hours of darkness. Numerous short-skip openings are forecast for 20 meters, between distances of 350 and 2300 miles. During May, propagation conditions are expected to peak on 20 meters during the late afternoon and early evening hours.

Although fewer 40 meter DX openings are expected during the month, some fairly good openings to several areas of the world should be possible from shortly before sunset, through the hours of darkness, until shortly after sunrise. Daytime short-skip openings are predicted for distances between approximately 150 and 750 miles, with nighttime openings extending up to 2300 miles, and beyond. Static levels are expected to be noticeably higher on 40 meters during May. DX conditions on both 80 and 160 meters are expected to decline during the month as a result of higher static levels, increased ionospheric absorption, and fewer hours of darkness. During the daylight hours, 80 meter short-skip openings should be possible between distances of approximately 50 and 250 miles, while 160 meter openings will be limited to distances less than approximately 50 miles. During the hours of darkness 80 meter openings are predicted for distances up to 2300 miles, and beyond, while 160 meter openings should extend up to 1000 miles. Occasional 160 meter openings up to 2300 miles, and to some DX areas of the world, may also be possible on some nights during the month.

VHF Ionospheric Openings

A considerable increase in sporadic-*E* propagation is expected to result in occasional 6 meter openings during May. Openings of this type are most likely to occur between 9 A.M. and 1 P.M., and between 5 P.M. and 9 P.M., Local Standard Time, between distances of approximately 1000 and 1400 miles. DX openings between stations

*11307 Clara St., Silver Spring, Md.

in the southern part of the United States and Central America may be possible on 6 meters as a result of sporadic-*E* propagation.

Aquarids, a fairly large meteor shower, is expected to occur during the first week of May. This should result in some meteor-type ionospheric openings on 10, 6 and 2 meters.

May is generally a month of little auroral activity. If auroras do occur, however, there is a good possibility that 6 and 2 meter propagation may be possible for distances up to approximately 1200 miles as a result of reflection or scatter from ionospheric patches produced by the auroral display. Auroral activity is most likely to occur during below normal or disturbed propagation periods (see the "Last Minute Forecast" at the beginning of this column).

Sunspot Cycle

The Zurich Solar Observatory reports a monthly sunspot number of 23 for February 1963. This results in a 12-month smoothed sunspot number of 34 centered on August 1962. A smoothed sunspot number of 25 is predicted for May 1963, as the solar cycle continues to decline slowly.

Computer Propagation Predictions

Since January, basic propagation data published by the Central Radio Propagation Laboratory (CRPL) of the National Bureau of Standards is being derived from a numerical mapping

[*Continued on page 91*]

CQ Short-Skip Propagation Chart
May-June, 1963

Band Openings Given in Local Standard Time

At Path Mid-Point (24-Hour Time System)

Band (Meters)	*50-250 Miles*	*250-750 Miles*	*750-1300 Miles*	*1300-2300 Miles*
10	*Nil*	07-09(0-1) 09-13(0-2) 13-17(0-1) 17-21(0-2) 21-23(0-1)	07-09(1) 09-13(3) 13-17(1-2) 17-21(2) 21-07(1)	07-09(1-0) 09-21(2-0)
15	*Nil*	06-09(0-2) 09-13(0-3) 13-17(0-2) 17-19(0-3) 19-23(0-2) 23-06(0-1)	06-09(2) 09-13(3) 13-17(2) 17-19(3) 19-23(2) 23-06(1)	06-09(2-0) 09-13(3-0) 13-17(2-0) 17-19(3-1) 19-23(2-0)
20	*Nil*	06-09(0-2) 09-16(0-4) 16-20(0-3) 20-23(0-2) 23-06(0-1)	06-09(2) 09-16(4) 16-20(3-4) 20-23(2) 23-06(1)	06-09(2) 09-15(4-3) 15-20(4) 20-22(2-3) 22-23(2) 23-05(1)
40	07-09(0-2) 09-15(1-4) 15-19(2-4) 19-21(1-2) 21-23(0-1)	07-09(2) 09-15(4-2) 15-17(4-3) 17-19(4) 19-21(2-4) 21-23(1-3) 23-07(0-2)	07-15(2-1) 15-17(3-1) 17-19(4-2) 19-21(4) 21-23(3-4) 23-02(2-4) 02-07(2)	07-17(1-0) 17-19(2-1) 19-02(4) 02-04(2-3) 04-06(2) 06-07(2-1)
80	07-10(4) 10-18(4-3) 18-22(4) 22-01(2-4) 01-05(2-3) 05-07(3)	07-10(4-1) 10-16(3-0) 16-18(3-1) 18-20(4-2) 20-01(4) 01-05(3) 05-07(3-2)	07-08(1-0) 08-16(0) 16-18(1-0) 18-20(2-1) 20-22(4-3) 22-01(4) 01-05(3) 05-07(2-1)	07-18(0) 18-19(1-0) 19-20(1) 20-22(3-2) 22-01(4-3) 01-05(3-2) 05-06(1) 06-07(1-0)
160	05-07(4-1) 07-09(3-0) 09-18(2-0) 18-20(3-1) 20-22(4-2) 22-05(4-3)	05-07(1) 07-18(0) 18-19(1-0) 19-20(1) 20-22(2-1) 22-00(3-2) 00-03(3) 03-05(3-2)	05-07(1-0) 07-19(0) 19-22(1) 22-00(2-1) 00-03(3-2) 03-05(2-1)	05-07(0) 07-20(0) 20-00(1) 00-02(2) 02-03(2-1) 03-05(1)

Hawaii To:

*Openings Given In Hawaiian Standard Time**

TO:	*10/15 Meters*	*20 Meters*	*40 Meters*	*80/160 Meters*
Eastern USA	10-14(1) 14-16(2) 16-17(1)	01-05(1) 05-07(2) 07-14(1) 14-16(2) 16-18(3) 18-19(2) 19-21(1)	18-20(1) 20-23(2) 23-02(1)	20-21(1) 21-23(2) 23-01(1) 21-23(1)‡
Central USA	09-15(1) 15-18(2) 18-20(1)	05-08(2) 08-14(1) 14-16(2) 16-19(4) 19-21(2) 21-23(1)	19-20(1) 20-21(2) 21-01(3) 01-02(2) 02-04(1)	20-21(1) 21-00(2) 00-02(1) 22-00(1)‡
Western USA	08-18(1)† 09-15(1) 15-18(2) 18-20(1)	04-06(1) 06-11(2) 11-15(3) 15-19(4) 19-21(2) 21-23(1)	17-19(1) 19-20(2) 20-02(4) 02-04(3) 04-05(2) 05-07(1)	19-20(1) 20-21(2) 21-02(3) 02-03(2) 03-05(1) 21-02(1)‡

Alaska To:

Openings Given In Alaskan Standard Time§

TO:	*10/15 Meters*	*20 Meters*	*40 Meters*	*80/160 Meters*
Eastern USA	*Nil*	15-17(1) 17-19(2) 19-20(1)	*Nil*	*Nil*
Central USA	16-18(1)	15-17(1) 17-19(2) 19-21(1)	00-03(1)	*Nil*
Western USA	16-18(1)	15-17(1) 17-20(2) 20-22(1)	01-05(1)	*Nil*

Forecast Ratings

The numerical ratings appearing in parenthesis following each predicted time of opening indicate the *total* number of days during each month of the forecast period the opening is expected to occur, as follows:

(1) Less than 7 days; (2) Between 8 and 13 days; (3) Between 14 and 22 days; (4) More than 22 days.

On the Short-Skip Propagation Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the longer distance.

For the *specific* days of each month on which a particular opening is most likely to occur, as well as a day-to-day forecast of reception conditions (signal quality, noise and fading levels), see the "Last Minute Forecast" which appears at the beginning of this column.

All times are shown in Local Standard Time, using the 24-hour time system. In this system midnight is shown as 00, while 01 is 1 A.M., 02 is 2 A.M., etc. Noontime is shown as 12, while 13 is 1 P.M., 14 is 2 P.M., etc.

The *CQ* Short-Skip Propagation Charts are based upon a c.w. effective radiated power of 75 watts from a half-wave dipole antenna, a half-wave or higher above ground. The Charts are valid through June 30, 1963. These forecasts are based upon basic propagation data published monthly by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

*Hawaiian Standard Time is 5 hours *behind* EST; 4 hours *behind* CST; 3 hours *behind* MST; 2 hours *behind* PST and 10 hours *behind* GMT.

†Time of possible 10 meter openings.

‡Time of possible 160 meter openings

§Alaskan Standard Time (from Skagway to 141 degrees west longitude), is 4 hours *behind* EST; 3 hours *behind* CST; 2 hours *behind* MST; 1 hour *behind* PST and 9 hours *behind* GMT.

SPACE COMMUNICATIONS

GEORGE JACOBS*, W3ASK

THE gold medal winner of the 1962 New York State Science Congress is a radio amateur, Martin Alter, WA2IGF. The imaginative 17-year-old high school senior from Lake Success, New York, won the medal for his entry of a home-built scientific satellite which he calls THRISES I.

Working evenings and weekends, Martin designed and fabricated the satellite in his basement workshop over a two-year period. He financed the project from his radio and TV repair service, sales of home-made electrical gadgets, mowing lawns and baby-sitting. Much of the harder-to-get components, such as transistors for the telemetry transmitter, sensor elements for the measuring circuits, and solar cells for the power supply, were furnished as gifts by several industrial firms encouraging space age science projects at the high school level. One such firm, the Leach Corporation of California, was so impressed with Martin's satellite project that it set up a special production line to manufacture relays to his specification. Martin used the relays for building a computer which automatically, and swiftly converts telemetry signals received from the satellite into useful scientific information.

The THRISES I satellite is no toy. It is a complex scientific package capable of measuring temperature, humidity, radiation, illumination and solar energy. It is from the first letter of each of these functions that the satellite derives its name, T-H-R-I-S-E- and the final S for satellite.

THRISES Communication System

Signals from the satellite's various measuring devices are transmitted by a novel telemetry system designed by Martin. The heart of the system is a four stage, completely transistorized 100-milliwatt two-channel transmitter which operates in the 27 mc Citizens Band. The transmitter relays the telemetry signals from the satellite to a Citizens Band receiver and a home-built computer system in Martin's basement. The computer swiftly converts the telemetry signals into meaningful readings of temperature, humidity, radiation, illumination and solar energy levels.

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The electrical and electronic circuits in THRISES I receive power from cadmium-nickel batteries which are kept in a charged condition by banks of solar cells mounted on the surface of the satellite. Although the satellite's telemetry system has been tested only over short distances on the ground, it has the capacity of relaying scientific data over great distances from outer space.

Unlike the amateur radio satellite OSCAR, THRISES has never been launched into space. Martin Alter is confident that his home-built satellite could successfully withstand the rigors of space. He doubts, however, that the government will spend a rocket on it. "Rockets," he says, "are so expensive."

THRISES Awards

Although not yet launched into orbit, THRISES has received considerable acclaim. Exhibited last year at the New York State Science Congress in Corning, and later at the New York Exposition at Syracuse, WA2IGF's working satellite was seen by some 400 thousand visitors. New York State Governor Rockefeller has singled the youthful scientist out for "outstanding achievement in science," and awarded Martin a plaque symbolic of this honor. Most important among the honors received by Martin for the design of the THRISES satellite, was a scientific scholarship to Brooklyn Polytech, where he is presently in his freshman year of Engineering.

Martin Alter owes his interest in electronics to a Cub Scout project he undertook when he was nine years old. Fascinated by battery and light arrangements on a gadget he put together with his father, he talked his Dad into giving him half his basement workbench so he could carry out further experiments with electricity. A few years later Martin received his amateur radio license (WA2IGF), and, needless to say, Dad lost his entire workbench and eventually the whole basement. Interest in amateur radio gave Martin his basic technical knowledge and the stimulation for beginning the THRISES satellite project.

From a Cub Scout fascinated by electricity, to a radio amateur designer of a home-built satellite, to an Engineering student in college,

[*Continued on page 92*]

HAM CLINIC

CHARLES J. SCHAUERS*, W4VZO

THE perfect radiator of r.f. energy has never been invented, nor is it ever likely to be. However, some of the letters received by HAM CLINIC indicate that we have many hams who think that merely by having the correct amount of installation space and money, one can come up with an antenna that radiates every bit of generated r.f. energy in a desired direction. But this is not true.

If every bit of r.f. energy could be concentrated into a very narrow beam (as it is in the LASER) and it would not be affected by the terrain over which it passes, all signals would be S-9 + 60 db! But this is impossible!

What every ham wants is a good *practical* antenna system which radiates as much of his generated r.f. power as possible and theory be derned! But before any ham can be fully satisfied (he like those before him) must try out a number of antennas before he settles on one which pleases *him*.

To the queries from HAM CLINIC readers who ask, "is the Brand "X" vertical better than Brand "Y"?", we say, if they are in the same price class, the difference will be negligible. You get what you pay for—make no mistake about this. On the other hand, the slogan, "ask the man who owns one" is not the best assurance of obtaining the article which will suit you; for he may be satisfied with much less than you are willing to settle for.

Questions

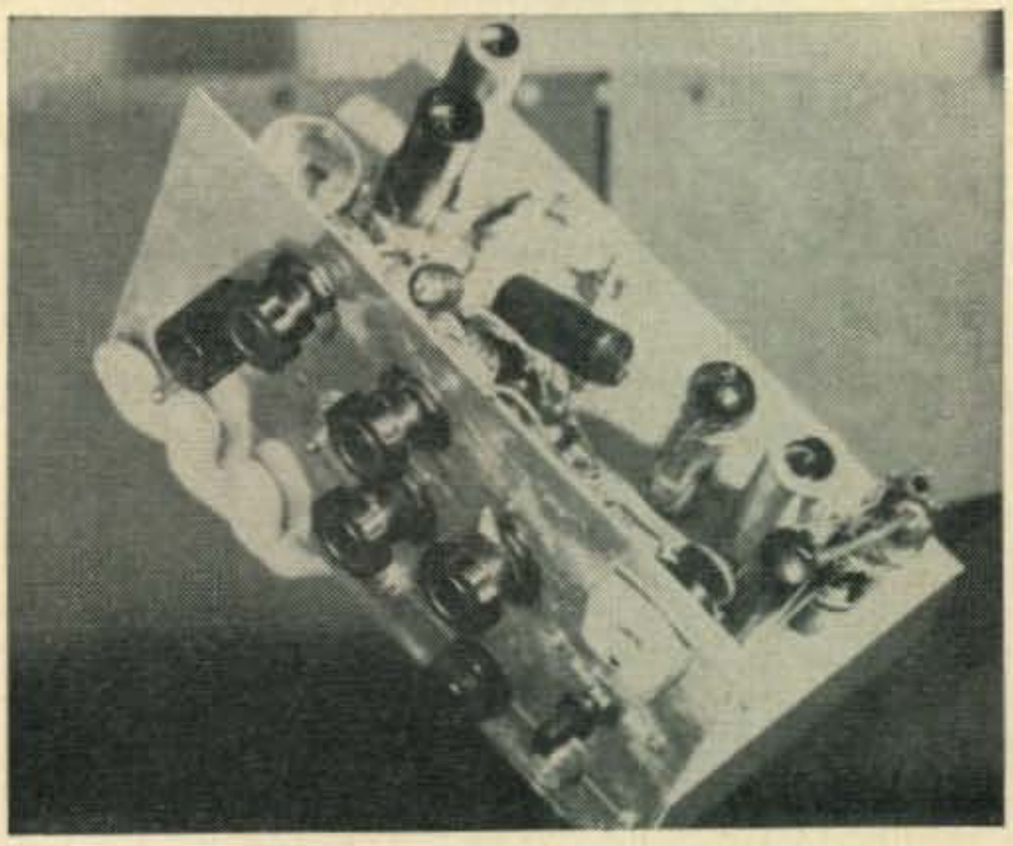
Stacked "V" Beam—"How much more gain has the stacked V beam antenna as compared to the single V?"

The stacked V has about twice the gain as its single brother (about 3 db more).

V.h.f. Antenna Length—What is the formula for figuring the length of a half-wave antenna in the v.h.f. region?

For construction purposes, this formula: $\text{Length (inches)} = \frac{5540}{F\ (\text{mc})}$ will suffice. The formula takes into account the end effect or the changed ratio of diameter to element length.

Adapt-O-Citer Winner—The first picture we have received of a completed and working Adapt-O-Citer constructed from information in the



VE1BCT's version of the Adapt-O-Citer which appeared in CQ for June 1962,—the special *Ham Clinic* issue.

Special HAM CLINIC issue of *CQ* (June 1962) was submitted by VE2BCT Jean Treskin of Pont-Viau (Montreal). Jean says others in his area are building the 'citer, for a first try at s.s.b.

A buffer stage and v.f.o. was added to the 'citer. A 6DQ5 final is now under construction. He completed the unit for only $22!

Congratulations Jean and thank you so much!

75A-4 Receiver Improvements—Now and then, we receive mail from hams like "Cap" Frazier, W4TAI who offer technical tid-bits of general interest to all hams. This time he has compiled (from experience) worthwhile improvements for the 75A-4 receiver. Thanks Cap.

Replace V_5 the 2nd mixer which was originally a 6BA7 and substitute a 6U8A to obtain a lower noise figure. A little rewiring is necessary but is worth the effort. Replace V_2 the r.f. amplifier (originally a 6DC6) with a 6BZ6. Better sensitivity is realized. No rewiring is necessary. Just substitute. Replace V_{17}, a 5Y3 with a silicon diode rectifier combination to reduce heat. TAB has the inexpensive unit. S.s.b. and c.w. reception will be improved and more i.f. gain obtained by simply removing one end of resistor R_{46} which is across i.f. transformer L_{27}. This resistor is used to de-Q the i.f. transformer and its removal very slightly degrades a.m. but the additional peaking attainable with its removal is worth the trouble. The side-tone monitoring signal of the Collins S-line or Heath Marauder can be

[*Continued on page 94*]

*c/o *CQ*, 300 W. 43 St., New York 36, N. Y.

sideband sideband sideband

SIDEBAND

IRV & DOROTHY STRAUBER*, K2HEA/K2MGE

SSB DX HONOR ROLL

TI2HP	282	W3LMA	251	K6MLS	235
VQ4ERR	282	G8KS	250	WØCVU	235
W8EAP	277	W5IYU	250	K6ZX	235
W8PQQ	276	VK3AHO	249	W1AOL	232
W2ZX	275	W2VCZ	247	WA2IZS	231
PY4TK	274	W6BAF	246	YV5AFF	230
W2FXN	270	G3NUG	246	K4PUS	226
HB9TL	268	DL1IN	245	W2NUT	225
K8RTW	265	W6PXH	245	VE3BWY	225
W6UOU	265	WØUUV	243	G3DO	225
WØQVZ	262	W6RKP	243	K4AJ	220
MP4BBW	261	K1IXG	240	K6LGF	220
K4TJL	260	W8YBZ	240	WA6EYP	220
W40PM	259	I1AMU	237	W2VZV	219
K9EAB	256	G2BVN	237	UR2AR	215
PZ1AX	254	W6WNE	237	W1UOP	211
K2MGE	253			W3VSU	210

SSB DX ENDORSEMENTS

W8PQQ	275	W9EXY	200	K4VQP	100
W2ZX	275	W6YMV	200	K6GHU	100
W5IYU	250	W2BQM	175	W6DIX	100
YV5AFF	225	W4NJF	175	SM5MC	100
K4PUS	225	ZS6ATA	175	DL3RK	100
W2BQM	200	KØTJW	150	DL2AB	100
VE3BWY	200	W5NTL	125	W8OQV	50
G6LX	200	W1MZB	125	VS9APH	50
GM3JDR	200	W6NWZ	125	W2PDB	50

Take a good look at sideband's most unique awards—the K6MLS Trophies which will be the prize possessions of the first three operators to submit proof of contacts with 300 countries on two-way sideband and which will never be duplicated.

OUR column has space for only fifty of the world's top sideband DXers. In order to keep the *CQ* SSB DX Honor Roll current, our policy is to list, in order of their scores, those who keep in touch with us at least once every three months. If your score is higher than some of those listed and you find your call missing from the Honor Roll, it is only because you have failed to bring us up to date on your latest confirmations. Forms for listing your confirmations are available from the SIDEBAND Editors when you send your request for them along with a stamped, self-addressed envelope. Although we do not insist that you use these official forms, we must request that you use at least a 5×7 or larger sheet of paper, even though you are requesting credit for only one or two confirmations.

It would also be most helpful if you included an s.a.s.e. for all credit and sticker requests. Both our "Worked 50" and "Worked 75" Certificates give you extra credit in the CHC. We notice that many operators start their request with "Worked 100" and we know that they are being deprived of the two other certificates. So let us know when you apply for the "Worked 100" if you wish the first two and they will be included.

*12 Elm Street, Lynbrook, New York.

Remember CR8AA ?

It's only a memory now, but as this is being written, the tension and excitement and, for some, the unavoidable disappointment of Wally Cuga's DXpedition to Portuguese Timor as CR8AA still lingers on. For Wally, W9JJF, "the world's greatest DX operator," this was the culmination of a lifetime dream to be "rare DX", an aspiration shared by anyone who has been in the thick of a pile-up. Just imagine *you* on a plane bound for Australia with plans for visits to Timor, Indonesia, India, Singapore, Hong Kong, and Aden in your pocket!

Although the East Coast boys found it mighty rough going and, in most cases, almost impossible to hear CR8AA, due to propagation conditions, their disappointment was eased considerably by the generous efforts of W7PHO, WA6ZIQ, K6MLS and others in more advantageous areas to cut a path through to Wally. Wally himself went without sleep (and often food) almost continuously to be on tap should the band open up. It was very heartening and in the true spirit of amateur radio to see the cooperation among the DXers on both coasts.

Although the efforts were in vain, they were greatly appreciated.

KH6EOQ is "On The Air"

After more than 12 years' efforts, U.S.A. Tripler General Hospital in Honolulu, Hawaii, finally got its ham station, KH6EOQ, in December, 1962. The new station has two functions: MARS and morale. As part of the Army MARS hook-up, Tripler is in a position to respond to civil emergencies during disaster operations. However, its primary goal is enabling hospitalized service men to talk with friends and relatives throughout the world.

Credit for the idea of establishing the station goes to the Hawaiian Women's Amateur Radio Club which, as early as 1951, began investigating the possibilities of starting a hospital station. Originators of the plan were Jeannette DeLong, President of the club; Hazel Keefer, and Louise Bostwick. Through their efforts and those of other local amateurs their long time dream has become a reality.

We felt the fact that it had taken such a length of time to get this station into operation would help you appreciate even more any contact you might have with KH6EOQ.

K6MLS Trophies Ready For Winners

As you can see from the accompanying photograph, the K6MLS Trophies are not only ready, but waiting to be engraved with the names of the first three operators in the world to have 300 2-way s.s.b. countries confirmed. Once these three trophies are claimed, that's it, "there ain't no more". That's how unique they are! To qualify for these trophies, send your 300 cards with an alphabetical listing of calls to the *CQ* SIDEBAND Editors at their home address. Date of postmark on the parcel will determine the order in which they are awarded.

All thanks for origination and execution of this plan to honor the top sideband DXers go to Dr. George Stauch, K6MLS. As you all know, George has been one of sideband's most ardent advocates with DX as his prime interest. In presenting these awards, it is George's purpose to repay sideband and DXers everywhere for the great pleasure he has derived over the past years. We salute George, K6MLS, for his unselfish devotion to amateur radio!

Notes on Linears

One of the problems in running a linear amplifier is knowing when the amplifier is operating at maximum output, efficiency and, most important, linearity.

The meter does not give an indication of any of the above; the only practicable way is with an audio oscillator and oscilloscope using the two tone test. This phrase should be familiar to you if you have been reading the ads; but just what is this two tone test?

The output of a s.s.b. linear modulated by the voice pattern or by a pure single frequency r.f. waveform will not give any real useful information even if displayed on a 'scope. The accepted practice is to make use of two pure sine waves at the input of the exciter to produce the pattern on the 'scope which you probably have seen displayed. It is essentially a double sideband suppressed carrier signal hiding under another name. In a phasing rig, it is produced by disabling one balanced modulator and inserting an audio tone at the input of the exciter. The filter exciter requires an inserted carrier of the same amplitude as the s.s.b. signal passing through the filter along with the single tone modulation. So, if you have a stable audio generator, or can borrow one, you're in business.

The reason for all this is the good old characteristic curves you ran across way back when you were plugging away at the books. You will remember there is a little item known as the load line. For an amplifier to be linear, the final tube must operate at its optimum point. With the coupling at less than optimum, peak current will have to be reduced to avoid distortion. With the coupling more than optimum, the tube will be able to draw its peak current but the plate voltage swing will be less than maximum and efficiency will fall.

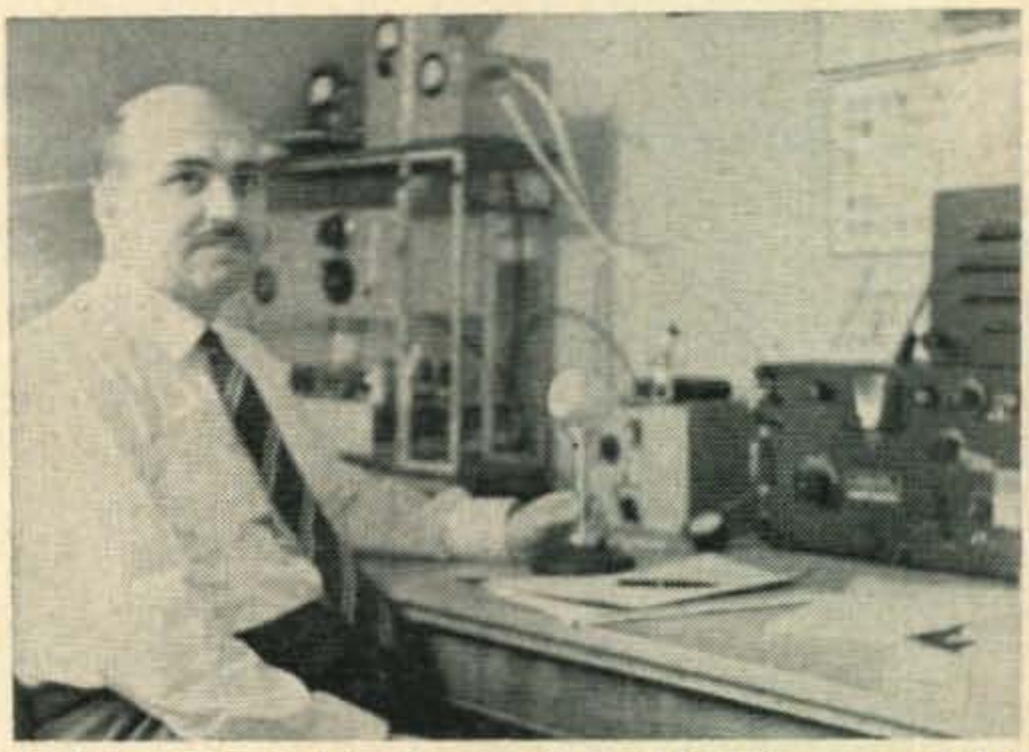
When undercoupled, efficiency will not be affected but input and output will be halved. Any attempt to increase the drive to force more output will result in distorted output.

When overcoupled, any attempt to increase efficiency by increasing drive can cause intermodulation distortion, excessive plate dissipation with shortened tube life.

If you do not have the equipment to make use of the two tone test in adjusting your linear and cannot borrow it, we can only suggest that you re-read your instruction manual. Somewhere in its pages you will find interesting information as to your equipments' proper operation.

It is best to remember tho', when in doubt, keep the audio down; if there *is* something wrong maybe it won't be as noticeable!

73, Irv and Dorothy



Back in 1960, Robby Kratzenberg, LX1RK, assumed this relaxed pose in front of his rig in his Luxembourg home. Today, he is operating as 9Q5RK in the Congo with a brand new license for which he waited almost two years.

the USA-CA PROGRAM

CLIF EVANS*, K6BX

TEN successful 'hunters' bagged USA-CA-500 during February while W6YC picked up notable endorsements.

USA-CA HONOR ROLL

KØWEM	179	W5WZQ	185
W6DIX	180	WA2PWI	186
W5KKL	181	K9YND	187
K5SHQ	182	W8IEC	188
K2ZKU	183	W6YC	1000 Seal
W9LXW	184		

Of the above, W9LXW's was for all phone and rest were for mixed operations. W6YC, holder of USA-CA-500 #1X added all 14 mc and all c.w. endorsements plus achieving USA-CA-1000 gold seal for tenth person at the 1000 counties level.

Full USA-CA Program Rules were printed in March issue. The 108-page USA-CA Record Books with individual state/county maps and alphabetical county lists are available direct from *CQ* for just $1.25. If you desire extra copies of the USA-CA Rules which include application forms, send s.a.s.e. to K6BX. Fact is, if you seek information on close to 1000 awards in the world, shoot along an s.a.s.e. and we will oblige to best our ability.

We Get Letters and Questions

Yes, we get literally hundreds every month and wish that New York Editor swab had space to publish them all, but don't stop sending them in . . . that's part of the fun, gambling with us we'll 'rate' a few more column inches in your behalf. You have already shown the blighter that even with usual deadline delays we can project ahead and scoop *today's* high interest news.

Bill, HK3RO, ". . . my application to join CHC . . . have 425 counties toward USA-CA . . . what a wonderfully exciting and enlightening program . . . congratulations on all the brilliant new ideas you keep coming up with which are pro to all hamdom. Yes Cliff, today, each and every QSL card is worth its weight in gold." (Bill, a doctor, reports a high percentage U.S. QSLs received lately show name of U.S. county)

Mary, K9BWJ, "Clif, thanks for info that both our old LARK award and the new LARK effective September 1, 1962, will count as separate credits for CHC. Your common sense approach toward raising awards standards is indeed a real hamdom service. USA-CA is a joy and my application will be along soon. Cliff, I work with ARRL W9 DX QSL Bureau. We, like all other similar bureaus, are holding hundreds of 'rare' DX cards for lack of s.a.s.e. and/or proper info for forwarding. It is especially evident many /MM stations and overseas service folks operating portable do not realize the treasures in QSL cards now filed away in various QSL Bureaus, so help us through your readership to 'pass the word'."

Avis, W8WUT, "Clif, last week I had long QSO with a mobile driving through Georgia. During conversation he mentioned being in, leaving or entering three different Georgia counties. His QSL card names all three counties as QTH for the QSO. May all such counties be claimed for purposes of USA-CA?" Answer: Yes, in all such cases where QSL card specifically confirms such QTHs.

Dewey, K5MOY/MM, "Clif Old Man, we

One of some twenty-five trophies presently planned for various category winners in the annual CHC/HTH QSO Party to be held at the end of this month. This one is sponsored by Cliff Corne, K9EAB, CHC-200 and holder of the Arne Trossman Top Honors Plaque. It goes each year to the Illinois CHCer making top score for that state.

*United States of America Counties Award Custodian, Box 385, Bonita, California.

WOW, isn't this a beauty? Here you see Betty, K4ZNK, President of YL Chapter No. 4, CHC, holding a trophy to be awarded high scoring YL CHCer in the upcoming CHC/HTH QSO Party. This is but one of possibly 25-30 trophies that will go to winners of various categories achievements for participating in the Party, besides winner certificates, first, second and third place for continents, countries, U.S. states and VE/VO Provinces. See text and CONTEST CALENDAR for details.

really been out of touch for too long . . . hadn't read *CQ* for ages until recently here in South Africa I came across one. Yes sir, Clif, we just haven't been reading the 'right' literature, but we are 'on the beam' now and finally aware what we been missing while operating the Seven Seas all over the world Maritime Mobile. Had no idea because my QTH was constantly changing that I would be eligible for USA-CA and the hundreds of awards supported by the USA-CA Program. Likewise, we had no idea that contacts with us all over the world count for many awards. But Clif, this is one swab that finally got the word on your and *CQ*'s "fun unlimited". Also Clif, may we compliment you on establishing CHC /MM country status wherein such /MM is considered as validly representing whatever country within whose Territorial waters such ship is being operated under the provisions of International Law applicable."

Tom, WAØAHV, "Clif, I'm still wet behind the ears ham-radio-wise, but it sure didn't take any imagination on my part to see the tremendous fun to be had using USA-CA Program as a guide and approach. Been following your many programs and goodwill projects, especially CHC and FHC. What amazes me is, with 1600 active members and no one paying dues, how you ever make ends meet. We got you tagged as one guy who thinks more of his fellow-men than of a heavy pocket . . . enough said."

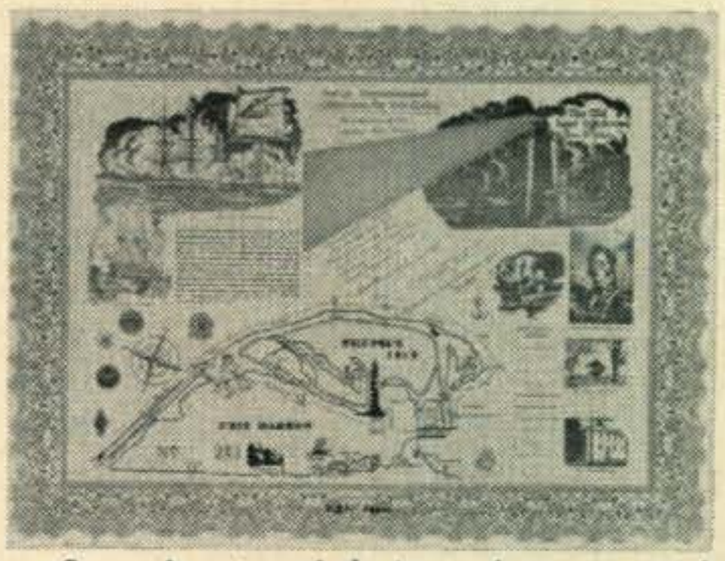
John, W5BUK, ". . . join the many who have expressed a "Well Done" for your USA-CA Department in *CQ*. I am a DXer (President WGDXC & DXCC 277/273) so with DX conditions steadily growing worse . . . it sure nice to have such a program which along with HTH *etc.*, where one can spend unlimited time making stateside contacts with real purpose. Please put me down as USA-CA Good Will Club member and willing to help any DXer identify U.S. counties . . . no QSL leaves my shack without county identity."

Hunt The Hunters

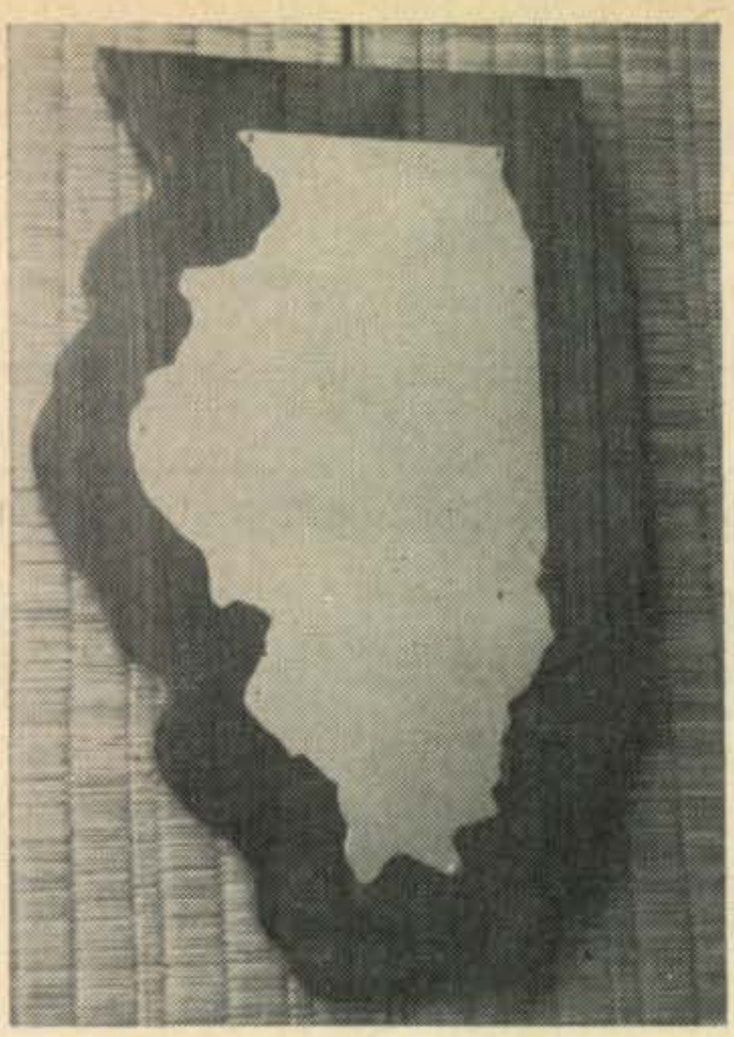
Once every year the CHCers hold an international QSO Party to help all hamdom pile up hundreds of awards contact credits for scores of top awards and certificates. Starting at 2300 GMT, Friday, May 31 and continuing through 0600 GMT, Monday, June 3 1963, nearly 1000 CHCers, representing all 50 states and close to 100 countries will be operating on all bands to help 'hunters'. See CHC/HTH QSO Party Rules in CONTEST CALENDAR (see page xx) or send s.a.s.e. to K6BX for copy together with report form.

CHCers are those 'hunters' who already have

Here you see the new VHF Carination Award sponsored by Ohio VHF CHC Chapter #14 for working members; Ohio stations work 14; rest of U.S. (excluding KH & KL) and Canada, work 7; all others work 3. Endorsements for AOMB/M and additional members in steps of 14/7/3 over above. The year a Chapter member became CHC is effective date for individual contacts. For Associate members, all contacts must date after January 1, 1963. Send certified (GCR) list, full log data and 50¢ or 5 IRC to Custodian, George Buza, W8FKU, 465 Forestview, Bay Village 40, Ohio.



The Perry Sesquicentennial Award sponsored by Erie and Erie County Operators for contacting 10 Erie or Erie County, Penna., Stations during the period February 1, 1963 to September 15, 1963. Send list with full log data and 50¢ to Custodian, W3KPJ, 1806 Water Street, Wesleyville, Penna. Award has gold border and background with pictures in blue and map sketch in red. Pictures depict Perry's ships in action and historical landmarks. While you are working for the above award don't forget there is one also for working 10 members of the Radio Association of Erie, Inc., 150 West 6th St., Erie Penna.



A 'traveling' plaque sponsored by Illinois CHC Chapter No. 17 . . . to be retained for one year by the Illinois CHCer with high score in the CHC/HTH QSO Party this month. Each year a new winner's name and call will be inscribed and the plaque passed to him. The plaque is in physical outline of the state of Illinois. (Several similar plaques with other state outlines are in process of sponsorship.) Officers of Chapter No. 17, formed in February, 1963, are: President, Orma, W9BJH; First V.P., Clyde, WA9AJF; Second V.P., Cook County to be announced; Secretary-Treasurer, Cliff, K9EAB. Other officers are being appointed for 1963 pending first elections.

achieved 25 or more awards credits as established by the *Directory of Certificates and Awards*. Such credits range the entire scope of hamdom's personal achievements. Credits include ARRL office appointments, classes of license held, accredited code speed, merit awards, contest winners through third place, winners of various high-level operating achievement awards and real 'value' achievements of nature they enhance the stature of amateur radio within our society.

FLASH—Penna. Joins USA-CA Fun Unlimited

Announcing new Pennsylvania Counties Award sponsored by the Nittany Amateur Radio Club in 5 Classes as follows: (Last figure applies to DX stations excluding VE, but including KL & KH. VEs work same number of counties as U.S. stations). Class AA is for DXers only excluding VE but including KH & KL for working 67 Penna counties; Class A is for working 67/60 counties; Class B is 60/50; Class C is 45/40 and Class D is for 30/25 Penna. counties. Rules follow those established for USA-CA and as set forth in *Directory of Certificates and Awards*. Endorsements for AOMB/M. Various Classes are designated by seals. Send certified GCR or Notarized list with full log data covering confirmed contacts together with $1 or 10 IRC to club, P.O. Box 60, State College, Penna. For later seals or AOMB/M endorsements, send certified list as above together with 10¢ or 1 IRC. In correspondence send s.a.s.e.

The new Penna. award is now in design stage and we will bring you a picture of it in later

The unusually beautiful 'Hunt The YL Hunters' Award' sponsored by the YL Chapter No. 4, CHC, world wide. The 11 × 14" certificate has gold border and background and pictures CHC's Queen of The Hunt in purple robe. The crown worn by the queen is actually made up of minute diamond-like chippings glued to the Queen's golden hair. Various Classes of the award are indicated by the 2" gold seals with purple ribbons. See text for full story how to win this highly attractive achievement award.

issue. Congratulations to the Nittany ARC who have designed an award which will be well received world-wide and which will have many beams pointed toward the Quaker state. Specific congratulations go to W3MGP, W3NEM and K3OOU who have been the three spark plugs behind creation of the new Penna. award.

Hunt The YL Hunters

The YL Chapter No. 4, CHC, has geared up to make a 'big' noise in the CHC/HTH QSO Party at end this month. Rules for this year's Party gives bonus (2) credits for all YL contacts so it is expected the YLs will be out in force.

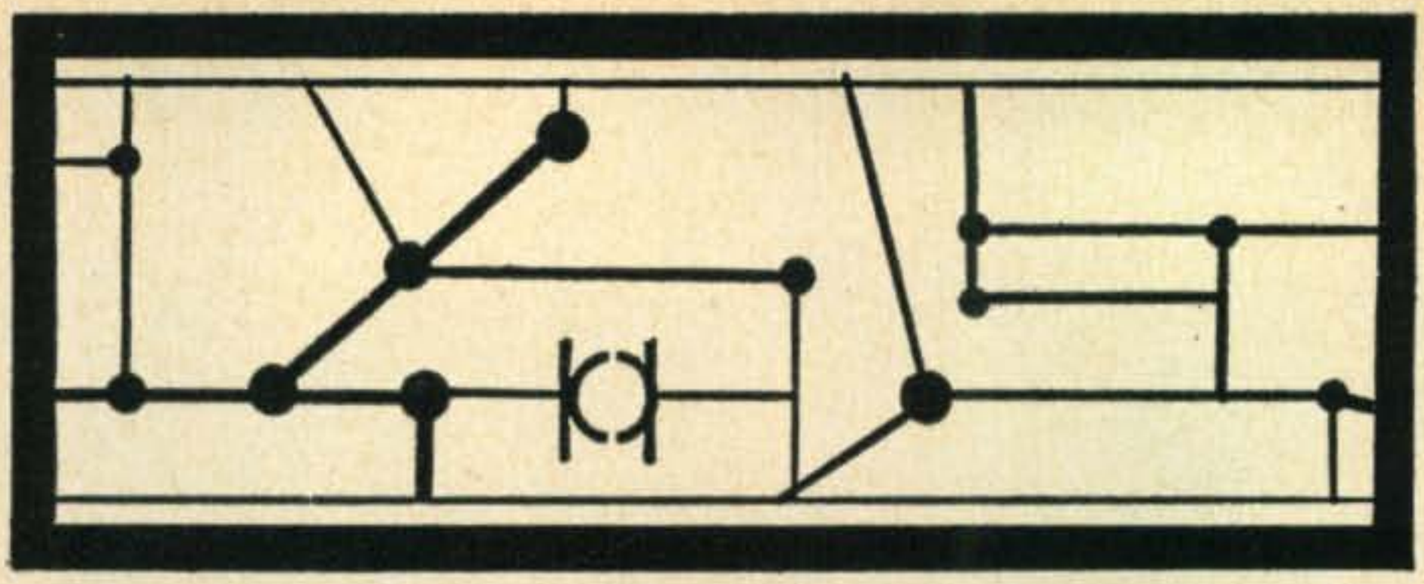
Just this week we received first sample copy of the Chapter's HYLH award for working members. Let's just say it is a beautiful creation and the most attractive of all YL certificates we've seen. Tillie, KØRGU, can be credited for certificate design. Also just received is a picture of the 33" high Chapter Trophy to be awarded high scoring YL CHCer in the CHC/HTH QSO Party.

Considering planned YL CHCer activity during the Party many should also win the Chapter's Hunt the YL Hunters' Award, HYLH, for working Chapter members in specified number of States and countries as follows: *Note*: NA is North America. DX is other than NA.

Class	*Member Contacts*		*States*		*Countries*	
	NA	*DX*	*NA*	*DX*	*NA*	*DX*
A	300	175	50	40	10	10
B	200	150	40	30	7	6
C	150	125	35	30	6	5
D	100	75	30	25	5	4
E	75	60	25	20	4	3
F	50	40	20	15	3	2
G	25	20	—	—	—	—

[*Continued on page 96*]

NOVICE



WALTER G. BURDINE*, W8ZCV

ALONG time ago my mother used to say at certain sessions at the seat of learning, "This will hurt me more than it hurts you". I always figured she was not aware of my hurt or she might have tempered her teaching program with a little more mercy. In case you don't understand my approach, this hurts me more to mention than it will hurt you to read. I hoped never to find it necessary to mention this subject.

It is well known that the amateur is the best guardian of his own rights and privileges. He will do his own police work and not have need for the authorities to help. The amateur can be trusted to do the right thing and say the right thing when the chips are down. He is a trustworthy, public spirited citizen willing to help any time and any place. In times of emergency he is in the forefront with his time and equipment. He has earned a good name for himself and his friends, and rightly so.

I personally feel I was granted a great responsibility when Uncle Sam said he trusted me well enough that he would allow me to give the examination, and I intend to honor that trust. I feel that *every* ham feels the same way about that trust and will uphold that honor and privilege. My faith in humanity would suffer if I should find out that a ham had betrayed his responsibility. I hope it never happens.

I would like to see the amateur kept in this high respect for all time, but we are going to have to do some police work within our ranks or lose *some* of that respect. This was brought home to me the other day when I was asked to give an examination for an amateur license.

This character actually offered me *twenty-five dollars* to pass him on the Novice and Technician examination. He promptly received a lecture that possibly knocked from his mind any idea of his ever becoming a radio amateur by that method. I intend to keep an eye on him and see if he ever gets smart enough to know right from wrong. I think mom taught me that in her school of learning. He told me too, that he could get a license for *ten dollars* in Dayton! If you think about it, there is no *degree* of honesty; either you are honest or you are not honest. I presume that most Novice and Technician license tests are given by licensed amateurs; I know the test can be given by others also. Please don't be a party to any unauthorized help with propositions of this sort. Remember, you have to live with your self as well as your fellow hams. I just can't imagine having a *jerk* like that in Dayton with an amateur license.

The Dayton Hamvention

One of the biggest gathering of amateur radio operators in this state will be held at The Biltmore Hotel April 26 and 27th. There will be prizes galore and speeches by some of the country's best amateurs. There will be technical sessions on just about every phase of amateur radio. The Hamvention will close with a big banquet and an address by a well known speaker. I was promised a schedule of speeches and prizes but it did not get here in time. There will be a good showing of *CQ* personnel there and you can get your subscription entered without even having to furnish your own pencil, hi.

Your reporter (me) will head up the Novice and Technician program and I will try to have something of interest for you. My session will be sometime around two o'clock. I promise to keep it at the Novice and Technician level. Hope to see you there; just hate to talk to an empty room. I hope you win one of the big prizes, seems I never win. See you there.

Six Meter Five Element Beam

Way back in 1949 I decided to get on six

*R.F.D. 3, Waynesville, Ohio.

Billy L. Moorefield, KR6NAA, Okinawa has more countries than he has states. Billy has worked 37 countries with one crystal. He will soon be stateside at Missouri. Good luck Billy, let us hear from you again.

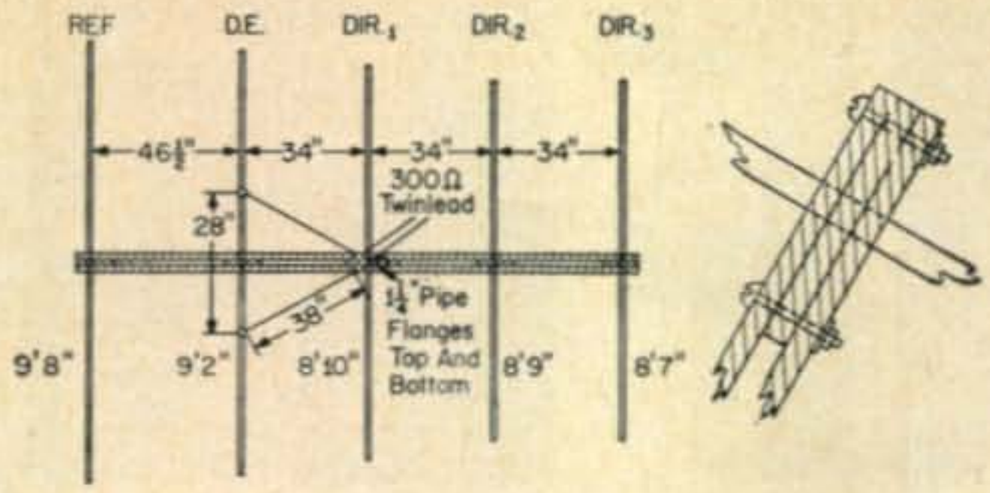


Fig. 1—A simple 5 element 6-meter beam used at W8ZCV. The beam is mounted to the mast by means of a pipe flange at the center of the boom. See text for details.

meters and among other things, I built a beam. This is the constructional data for building it (It works, too).

First, get two pieces of 1×2 pine 16 feet long with as few knots as possible. Give it one coat of aluminum paint and cut two pieces to a length of 150 inches for the boom proper. The balance of the wood is used to fill in the space between the two pieces used for the boom as shown in fig. 1. Be sure to get a length of about two feet in the center of the boom since a pipe flange will be bolted here and an element will pass through the boom. Use the balance of the wood to fill in equally between the two 150 inch lengths where the elements will pass through the boom. Use ¼ inch carriage bolts to fasten the boom together. Construct the boom on a level cement floor if possible. Mark the boom for the elements and drill holes to pass the elements. Try the drill for size on a block of wood so that the element will fit tightly. Follow with a small rat-tail file. This is important.

The completed antenna is mounted about two feet above the antenna rotator to reduce effects of wind resistance. Two 1¼ inch pipe flanges are used, one on top and one on the bottom of the boom. This strengthens the boom. Place the bolt holes that they don't weaken the boom unnecessarily. Paint the entire boom and all metal parts with good grade of aluminum paint. The elements are ½ inch diameter thick wall aluminum tubing from a surplus store or you can get it from "Dick's" as advertised in *CQ*.

The unusual feature is the Delta match. I have used it on all of my beams and it seems to work best of any matching system tried here. Another type of match can be used; see your handbook for complete details. Follow the drawings and I'm sure you will be proud of this low cost antenna. See you on six this summer.

Letters

Billy L. Morefield, KR6NAA, c/o S/Sgt. M. E. Morefield, 51st Support Sqdn., APO 235, San Francisco, California writes: "Dear Walt, I am a Novice on the Island of Okinawa and I enjoy reading *CQ* every month. I am 17 years old and senior at Kubasaki High School.

"My rig is a DX-40 and an SP-600. My antennas are a 1 element rotary and a dipole. I have worked 37 countries with one crystal at 21,155 given to me by KR6LK. I have worked 348 different stations in 563 QSOs to date and my WAS is 9/4 and I am waiting for the QSLs for my WAC. I think there are a lot of fine people in ham radio and I have really enjoyed myself since my first contact on June 30. I have taken my Conditional and am awaiting the results. My call in Texas is WN5CLH and I will be moving to Missouri soon and hope to be operating from there as W5CLH/Ø. I received a new v.f.o. for Christmas.

"In case Santa reads this I want to put in a good word for Dick KR6LD. Dick is ex-KH6BRX and ex-W3MTU. He has helped me and many other high-school boys here in getting our tickets and my only wish is to be a good c.w. man like Dick and win lots of awards. I want to thank everyone who has come up on 21,155 and worked me. I will work the rest of you from Missouri. 73, Bill."

Bill, your ambition to be a good c.w. man and your record of operations from KR6NAA proves that you are in there pitching to gain those goals. You will be successful if you keep at it. Thanks for the letter, the first from Okinawa and the 18th country heard from since starting this term as your reporter.

From Westbrook, Maine comes the next letter: "Dear Walt, In answer to your question in the December *CQ*, I'm a "younger generation" ham and have these awards: WAS, WAC, WBE, DXCC, USA-CA (#168), CHC, BPL, U.N. Award, Kroonstad, WAV, WBH, Moonshiners, CAA, A25, W24, WANE, WNH, WAMC, WAM, W-CONN, RCC, CP-30, HTH300 and am a member of the QRP radio club. I received my "talking ticket" on my 14th birthday. I am 16 now. The rig is a DX-40. S-108, home brew keyer and 3 dipoles. I can be found almost any time on the 14 mc CHC frequency.

"Keep up the good work 73 and good hunting, Ken, K1MBM."

Help Wanted

In the December help wanted section this fellow was listed without name but says he still got a call from one of the nicest people. He says hams are the nicest people. (What did I tell you?) His name is Maxwell B. Sklar, 348 East 54th Street, Brooklyn 3, New York. He still sends my mail to New York, otherwise I could have put this letter in the last issue.

Jack Heim (14) and others needs help with code and theory. Contact: Jack Heim, 2428 West 26th Street, Topeka, Kansas. Phone: FLanders 4-7489.

Larry Johnson (13), 5305 Walton Drive, Klamath Falls, Oregon needs help with code and theory.

Jeff Newbro (14), 46-34 261 Street, Great Neck, New York has a receiver and would like to have some help with designing and building a transmitter. He needs help in getting the license also.

[*Continued on page 98*]

VHF

DONALD L. STONER*, W6TNS

DON'T FORGET!

The Spring *CQ* VHF Contest (complete with brand-new rules designed for the ultimate in fairness and convenience to the operator) will take place May 4 and 5. You won't want to miss this great new v.h.f. brawl. See page 32 of March *CQ* for complete rules. Logs, cover sheets and rule sheets are available from *CQ* for one s.a.s.e.

ONE of the points discussed last month with regard to increasing your modulation is speech clipping. If you connect a microphone to an oscilloscope, you can observe the electrical impulses which represent your voice. Whistling into the microphone will cause a display which approximates a group of sine waves which may be pure or distorted. However, the voice bears no semblence to a sine wave but rather, consists of approximately 25% very high amplitude peaks with the remaining 75% down at least 10 db (1/10 the amplitude of these peaks). If in some manner we could chop off or compress these peaks, it would be possible to bring out the low energy part of the voice to the same level as the original peaks without overmodulation. It is quite easy to add about 10 db of "talk power" without having badly distorted modulation. It should be pointed out however, that any modification of the voice wave form represents distortion and it is only a matter of degree as to how much is tolerable. If you use too much compression or clipping, you will defeat your original purpose, that is to be more readable at some distant receiving location. For this reason, most clippers have level controls which permit you to adjust the degree of clipping for best results with your own voice. There is another point that should be mentioned in conjunction with speech clipping. Because of the increased gain in the modulation channel, the microphone will be much more sensitive to noise pick-up from background sounds. On a local contact this can be quite annoying. Thus the modulation booster should have an in-out switch or some method to turn it off when it is not needed. The only time the clipper is really useful is on a long haul circuit where those few extra db are really needed.

Figure 1 can be used in conjunction with any a.m. rig. One-half of a 12AX7 is used to increase the microphone voltage to 10 or 15 volts. This is then applied to a volume control which regulates the level of audio to two zener diodes connected back to back. The characteristics of zener diodes make them well suited for this application. The diodes shown in fig. 1 will clip any signal peak which exceeds 3.9 volts. Thus, by increasing R_1, the input pot, the degree of clipping can be controlled. Because of the low impedance of the zener diode, clipping of the wave form is very abrupt and numerous harmonics are created. These harmonics must be attenuated and this is the purpose of the low pass filter consisting of L_1, C_1 and C_2. The audio voltage across the potentiometer will always be about 8 volts peak-to-peak whenever the zener diodes conduct. A portion of this voltage is fed to the second half of the 12AX7 for further amplification.

If you feed this directly into a high impedance microphone input, there will be excessive audio distortion in the first stage. The output of the second 12AX7 should only be used with rigs having low audio or for converting from carbon mike operation. To use the clipper directly into your mike jack, disconnect the second 12AX7 and connect the arm of R_2 directly to the mike jack through a shielded cable. It is not necessary to switch the clipper out of the circuit to eliminate the clipping of a voice wave form. Instead, simply turn R_2 to its maximum gain position and adjust the audio level with R_1. This will keep the signal below the clipping level of the zener

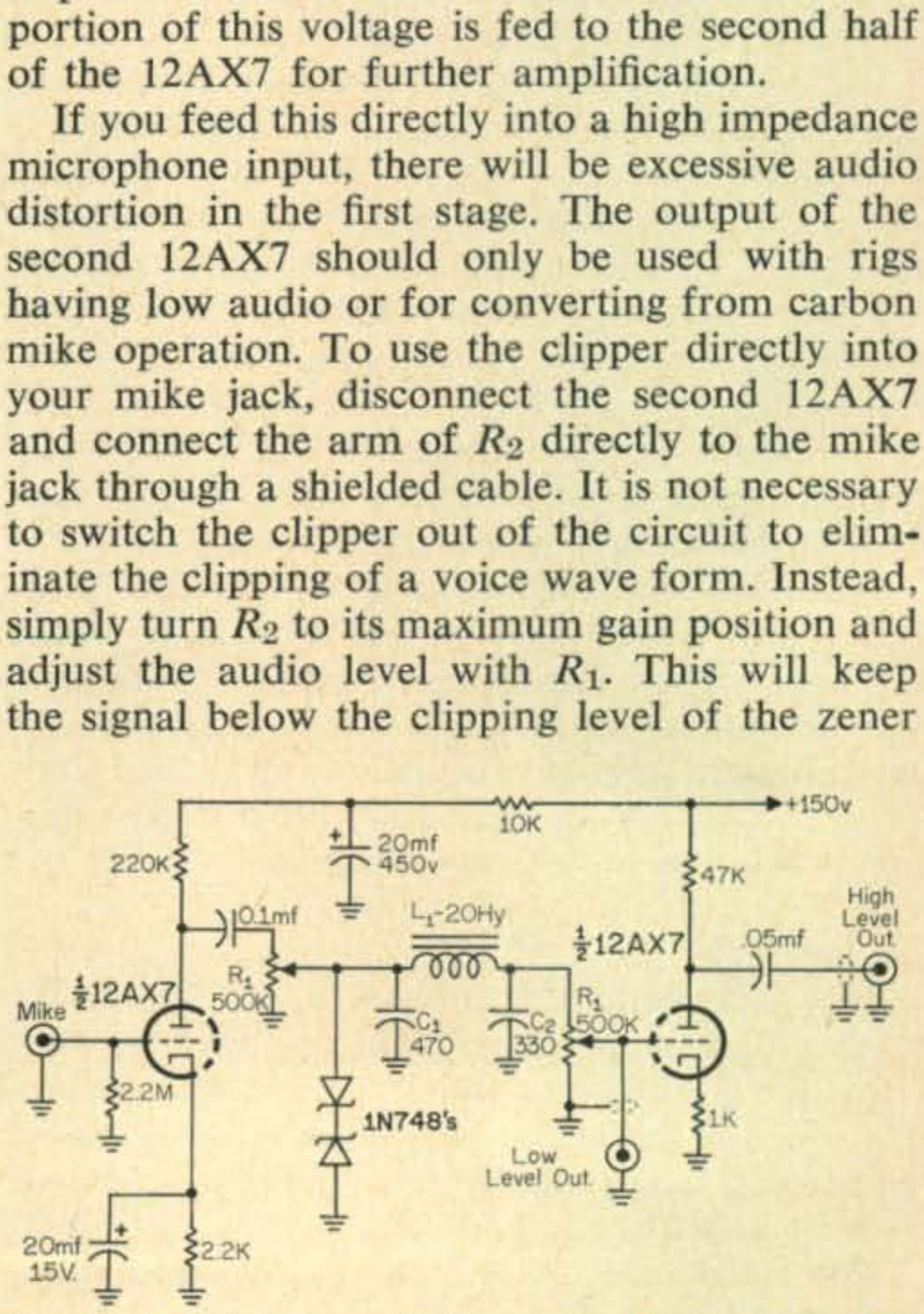


Fig. 1—Speech clipper that can be added outboard to any phone transmitter. See text for details.

*Alta Loma, California.

diodes. The desired amount of clipping can be introduced by turning down R_2 and turning up R_1.

V.H.F. Around the World

Dave Metzger writes to fill us in on v.h.f. in Morocco. He says that v.h.f. operation is permitted but not on 6 meters, as this is used commercially and closed to hams. Dave listens to 6 very often hoping to hear a stateside station during an opening. As he says, "If I ever hear someone I'll surely let him know. Morocco is a tremendous propagation area."

Richard Hasterga, K8GLG/DL4OJ writes from Germany with news that he will be working 6 meters mobile shortly after his return to the states. Dick is v.h.f. operator with the Army in Germany. You should hear him about the time you read this.

Bill Roper, VK3RZ wrote to advise us he is a keen v.h.f. enthusiast and is interested in corresponding with American hams having similar interests. Although Bill has an Amateur Operators' Certificate of Proficiency, which enables him to use all modes on all bands, he is primarily interested in 144 mc, c.w., s.s.b. and mobile. All the gear must be home brew and is primarily his own circuit ideas. If I may be allowed another pat on the back, Bill's letter continues, "Incidentally, you may be interested to know that your *Sideband Handbook* is quite popular in VK land and the v.h.f. sideband articles published recently in *CQ* will probably be responsible for a number of local amateur's trying this mode."

If you would like to write Bill, his address is Lot 59, Orchard Street, Count Waverly, Pictoria, Australia.

Bill Nielson, KP4BCA, USAG and Tech'SUC, Antilles, APO 851, New York, N. Y. would like to have conversion data to two meters for the AN/ARC-1 RT-18 transceiver. Can any of the readers help him?

What's New

How would you like to be able to see the v.s.w.r. of your antenna system directly on an oscilloscope? Telonic Engineering Corp. of Laguna Beach, California has produced a device (their model TRB-2 RHO-Tector) for just such applications. In addition to antenna systems, the sweep generator detecting system can be used for checking filters, couplers, amplifiers, signal generators and a variety of instruments and coaxial type components.

Who's News

James Bingham, K7IMH, 2950 S.W. 178 Avenue, Aloha, Oregon, is now on the air with Central Electronics 20A and P&H 6-150 driving a pair of 4X150's to a kilowatt on s.s.b. or c.w. Jim likes the P&H rig and hasn't any complaints on its operation. Further, he says his area is rather bare for s.s.b. but it shouldn't be too long in arriving.

Dave, K2ZSY reports having a lot of fun during his first six months on 6 meters with a Heath "Shawnee" and three element Telrex up about 25 feet. He heard WA5EXN and was tempted to call him long distance but the Cleveland-Little Rock rates were too high! On another band opening, he heard W5EUB and called him without results. Later he had a good band opening to Texas and worked W5BAO, K5YPH, K5GHR, K5TXX and W5CUG. Later in the month, Dave picked up WA4FRJ and WA4WJN.

Some time ago, this column featured a small one transistor 6 meter receiver. Lynn Wilkie, WA2DAC advises us that the circuit was designed by Carroll L. Dixon, K2DFS and not himself.

Steve Pierce, W5BIV/Ø is the proud owner of a Clegg 99'er but can't copy sideband since it does not have a b.f.o. Steve wonders if anyone make a commercial b.f.o. or product detector or has a conversion for this unit. You can reach him at 1440 Xenia-203, Denver 20, Colorado.

W9BPG of Gillespie, Ill. and his ultra-mobile 6 meter station.

Tower Hines, WA6LBM, 3221 Lassen Way, Sacramento 20, California, would like a design for a 220 converter using the GL6229 (General Electric). He also has 404's, 417's, 2C51's and assorted u.h.f. goodies. If anyone has a suitable converter, how about sending the information to Tower?

The accompanying photograph shows David Decobert, W9BPG of Gillespie, Illinois with his ultra mobile rig. He operates 6 meters with a 25 milliwatt walkie-talkie! No DX says Dave, but "I sure have a lot of fun with the locals."

Tom Jones, W4OTG of Birmingham, Alabama has confirmed his 150th station on 6 meters in only eight months. Look for him on the Century Club Honor Roll.

Bill Dillon, WA6LGE of Vallejo, California got in on a good band opening right after school was out a few months ago. He had several stations in 4 land with W4ACT (s.s.b.) being the strongest. Later when the band shifted to 5 land, he contacted K5QKV in Amarillo and K5EBZ in Austin. It finally shifted for a contact with K7CIN and K7QZA in Phoenix. The swan song for this opening was Bill's contact with WA6LGV in Spring Valley near San Diego. Most of the DX work was with a Heath "Sixer". That makes our Laser incoherent for another 30 days.

See you in 30,

73, De Don, W6TNS

YL

LOUISA B. SANDO*, W5RZJ

THE 13th annual Mid-west YL Convention is set for June 22-23 at Newberry, Mich. with the Upper Peninsular YLs serving as hostesses. Hospitality room will be at the Falls Hotel, along with the Sat. smorgasbord ($3) and evening of games. After a Sunday lumberjack breakfast (free to YLs), all will drive to Soo Jct. and board the trolley for the motor ship *Paul Bunyan* (boat trip free to YLs). Lunch, business meeting, and prize drawing will be held aboard ship. Send advance registration ($2) by May 15 to W8HAV, Zelma, at P.O. Box 483, Marquette, Mich.

Atlantic Div. Convention

W4TVT, Claire, sends word of the Atlantic Div. Convention to be held Labor Day weekend at the Sheraton-Park Hotel in Washington, D.C. K4LMB, Ethel, is general chairman for the ladies program and coordinator of XYL-YL activities. Claire is chm. of YL doings; K4EAM, Vi., chm. of hostesses; W3RXJ, Irene, P/C; K3NLU, Lillian, chm. YL Forum.

YLRL

A new appointment by YLRL's president, K6OQD: YLRL's Continuous Membership Certificate Custodian effective January '63 is Ruth Siegelman, W2OWL. This is one certificate you don't have to apply for—it is sent to members in recognition of continuous membership in the League.

The all-ham Thurn family, K7KDQ, Babs; K7KDP, Dorothy, and K7DVO, Fred, mobiled to the Disneyland SWD convention from Phoenix. All are members of the Copper State Road Runners (note Babs' embroidered shirt back), an Arizona mobile club started about three years ago. For family groups, club members provide emergency communications and enjoy weekend camping trips together.

Here and There

1963 officers of WHOOT, YL club at Dallas: Pres. K5MTF, Estelle; V.P., K5DLI, Liz; secy.,

[*Continued on page 100*]

*4417 Eleventh St. N.W., Albuquerque, New Mexico

Members of the UPYL Club. These gals will be hostesses for the 13th Mid-west YL Convention, June 22-23 at Newberry, Mich. L. to r., front row: K8ILN and jr. op., WN8DWM, K8OOY; second row: K8OMH, K8PNA, W8MMB, K8TGX, K8KIT, K8SUP, W8HAV, W8EIR, K8TYK; back row: WA8AHX, K8DWA, W8ATB, W8JXJ, K8VDT, WN8DHB, K8SRO and K8YEE.

RTTY

BYRON H. KRETZMAN*, W2JTP

RTTY Operating Frequencies

Nets centered on frequencies given; operation usually ± 10 kc on h.f.

80 meters	3620 kc
40 meters	7040 kc
20 meters	14,090 kc
15 meters	21,090 kc
6 meters	52.60 mc

LAST month we discussed the technical considerations involved in adapting an s.s.b. transmitter for radioteletype. We stated that most s.s.b. transmitter manufacturers (except Hammarlund) don't bother to build in RTTY. Kit suppliers were not discussed, so we would like to point out right now that the Heathkit Marauder s.s.b. transmitter kit *does* have the f.s.k. feature built in. Reports from the field of the Marauder on RTTY have been excellent. Shift stability apparently is very good and does not require readjustment once set.

The Marauder on F.S.K.

As originally designed the Heathkit Marauder required the operator to change the function switch from STANDBY to MANUAL each time the station went from transmit to receive on RTTY. K8JIC found this time consuming, inconvenient, and suspected that it would cause early failure of the function switch. By making the few simple changes recommended by K8JIC f.s.k. can be used with the function switch left in the PTT position and the transmit-receive changeover made by merely closing or opening the key shorting switch.

The conversion is begun by adding a switch contact on the function switch at position *MS2-9*. The wafer has a hole drilled for the contact but as supplied this position is vacant. You can spot position 9 by the position of the wiper contact when the switch is in the FSK position. Use a contact removed from a broken or useless phenolic switch wafer of the same type. Mount this new contact with a miniature screw no more than 3/64" diameter and about 3/16" long. Start early to locate this size screw as finding it is the hardest part of the conversion. Try a model railroader friend or a nearby hobby shop.

After the new contact is installed, solder a short lead from it *(MS2-9)* to *MS2-7*. The lead from *MS3F-3* to ground should be disconnected at the ground end. A new lead should also be soldered to *MS3F-3* and connected to *MS3F-1*.

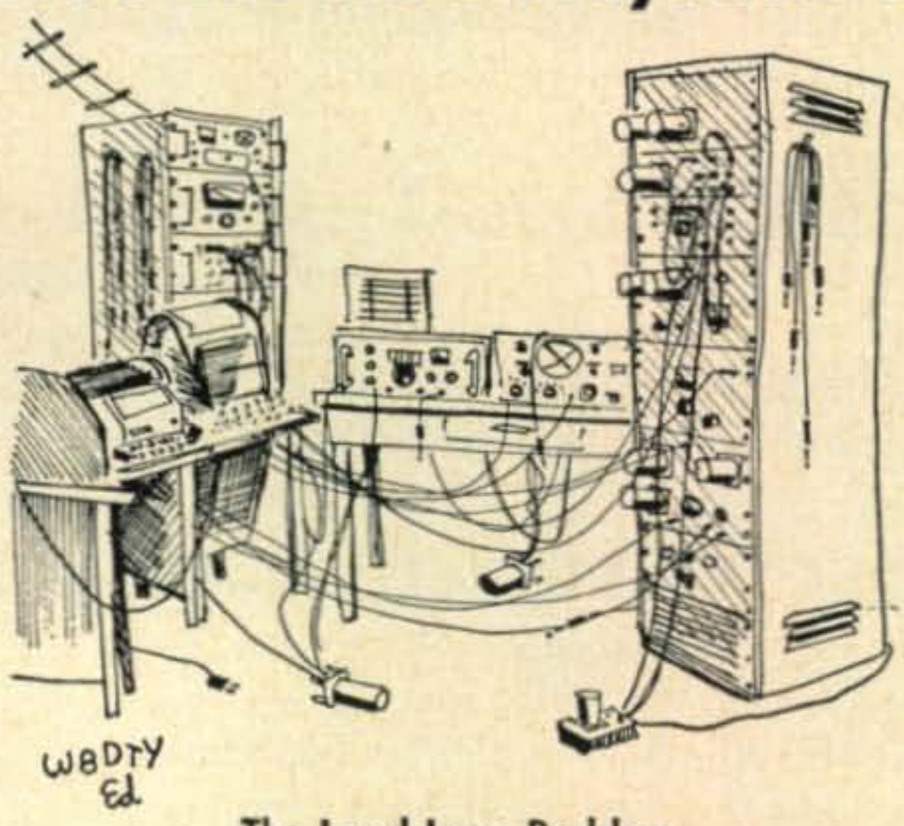
The Marauder will now f.s.k. in the PTT position of the function switch. To use c.w. for dual identification operate the key as if in the C.W. position. For f.s.k. merely close the short-

[*Continued on page 98*]

*431 Woodbury Road, Huntington, N. Y.

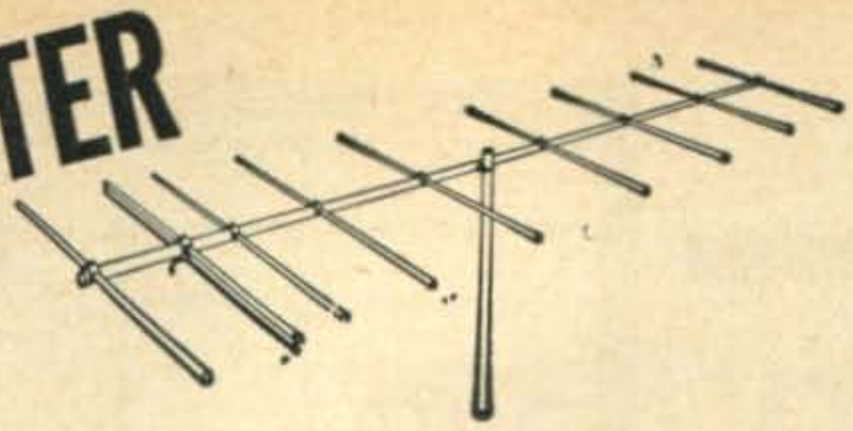
K8JIC/AA8JIC, Allen Park, Michigan. Equipment: Marauder s.s.b. exciter, Warrior Linear Amplifier, HQ-170C receiver, PAT TU, Model 15; and, GE transmitter/receiver for 2-meter f.m.

RTTY The Hard Way...No. 19



The Local Loop Problem.

NEW SCOTCH! MASTER



2 & 6 Meter Antennas

MOSLEY Model A-92-S

An introduction to the New MOSLEY SCOTCH-MASTER two meter beam. This nine element antenna may be mounted vertically or horizontally, providing excellent front-to-back ratio, handling maximum legal power, amplitude modulated or 2,000 watts P.E.P. SSB. Mounting bracket fits masts up to 1½ inch OD. Antenna is matched for 300 ohm balanced line. Boom is made of sturdy medium weight wall 1¼ inch OD aluminum tubing to achieve maximum strength with minimum weight and wind loading characteristics. Stacked arrays feature 300 or 75 ohm balanced feed.

SPECIFICATIONS AND PERFORMANCE DATA: Forward gain, 14 DB. Front-to-back, 20 DB. SWR, 1.5 to 1 or less at resonant frequencies. Maximum element length, 41 inches. Boom length, 12 feet. Turning radius, 6.5 feet. Assembled weight, 4 pounds. Maximum wind surface area, 1.25 square feet. Wind load, 25 pounds. Antenna is shipped in kit form. **Amateur Net $16.40**

MOSLEY Model A-76-S

Also introducing for the first time, the MOSLEY SCOTCH-MASTER six meter beam. This seven element array provides maximum forward gain with excellent directivity. SCOTCH-MASTER will handle the full legal power, amplitude modulated. Mounting bracket fits up to 1½ inch OD mast. Antenna is "Gamma" matched for 52 ohm unbalanced line. Boom is of heavy guage 1¼ inch OD aluminum. Easily rotated with TV rotor and can be mounted vertically or horizontally.

SPECIFICATIONS AND PERFORMANCE DATA: Forward gain, 12 DB. Front-to-back, 20 DB. Boom length, 24 feet. Turning radius, 13 feet. Assembled weight, 12.5 pounds. Maximum wind surface area, 2.5 square feet. Wind load, 51 pounds. Antenna is shipped in kit form, complete with detailed instructions. **Amateur Net $35.10**

MOSLEY Model A-56-S

The New MOSLEY SCOTCH-MASTER six meter beam features five elements, maximum forward gain and excellent directivity. This gamma matched beam will handle the full legal power amplitude modulated. Can be mounted vertically or horizontally. Feed with 52 or 75 ohm line.

SPECIFICATIONS AND PERFORMANCE DATA: Forward gain, 10 DB. Front-to-back, 20 DB or better. SWR, 1.5 to 1 or less at resonant frequencies. Maximum element length, 118 inches. Boom length, 12 feet. Turning radius, 7 feet 8¾ inches. Assembled weight, 6.5 pounds. Wind load, 32 pounds horizontally, 56 pounds vertically. Antenna is shipped in kit form, complete with detailed instructions. **Amateur Net $ 28.16**

••Mosley SCOTCH-MASTER Stacking Kits••

MOSLEY Model A-92-S-SK1

A kit for stacking two horizontally polarized A-92 SCOTCH-MASTER beams, one above the other. Comes complete with matching transformer, insulator, complete instructions and phasing line. Feed point impedance - 300 ohm balanced line. This stacked array will attain 3 Db additional gain over a single horizontally mounted beam. **Amateur Net $3.15**

MOSLEY Model A-92-S-SK2H

A kit for stacking four horizontally polarized A-92 SCOTCH-MASTER beams, two over two. Complete with support members, mounting plates, phasing line, insulators, hardware and instructions. Feed point impedance - 75 ohm balanced line. This stacked array will attain 6 Db additional gain over a single horizontally mounted beam. **Amateur Net $44.35**

MOSLEY Model A-92-S-SK2V

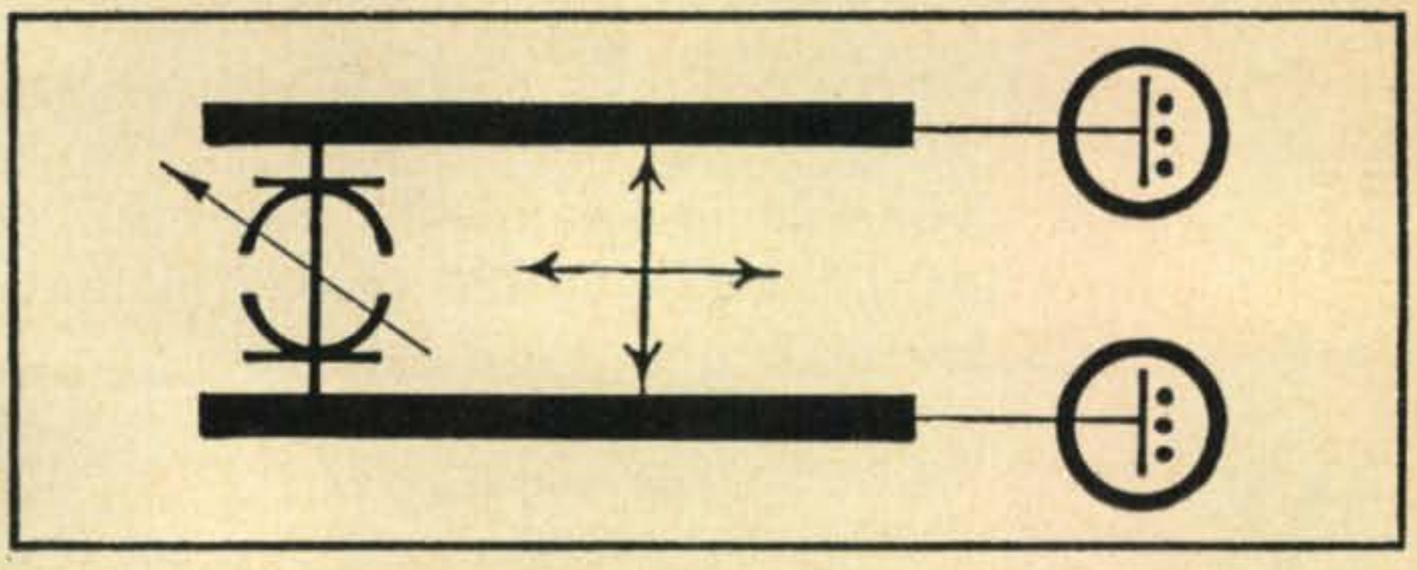
A kit for stacking four A-92 SCOTCH-MASTER beams, two over two, in the vertical plane. Comes complete with support members, mounting plates, insulators, phasing line, hardware and instructions. Feed point impedance - 75 ohm balanced line. This stacked array will attain 6 Db additional gain over a single vertically mounted beam. **Amateur Net $44.35**

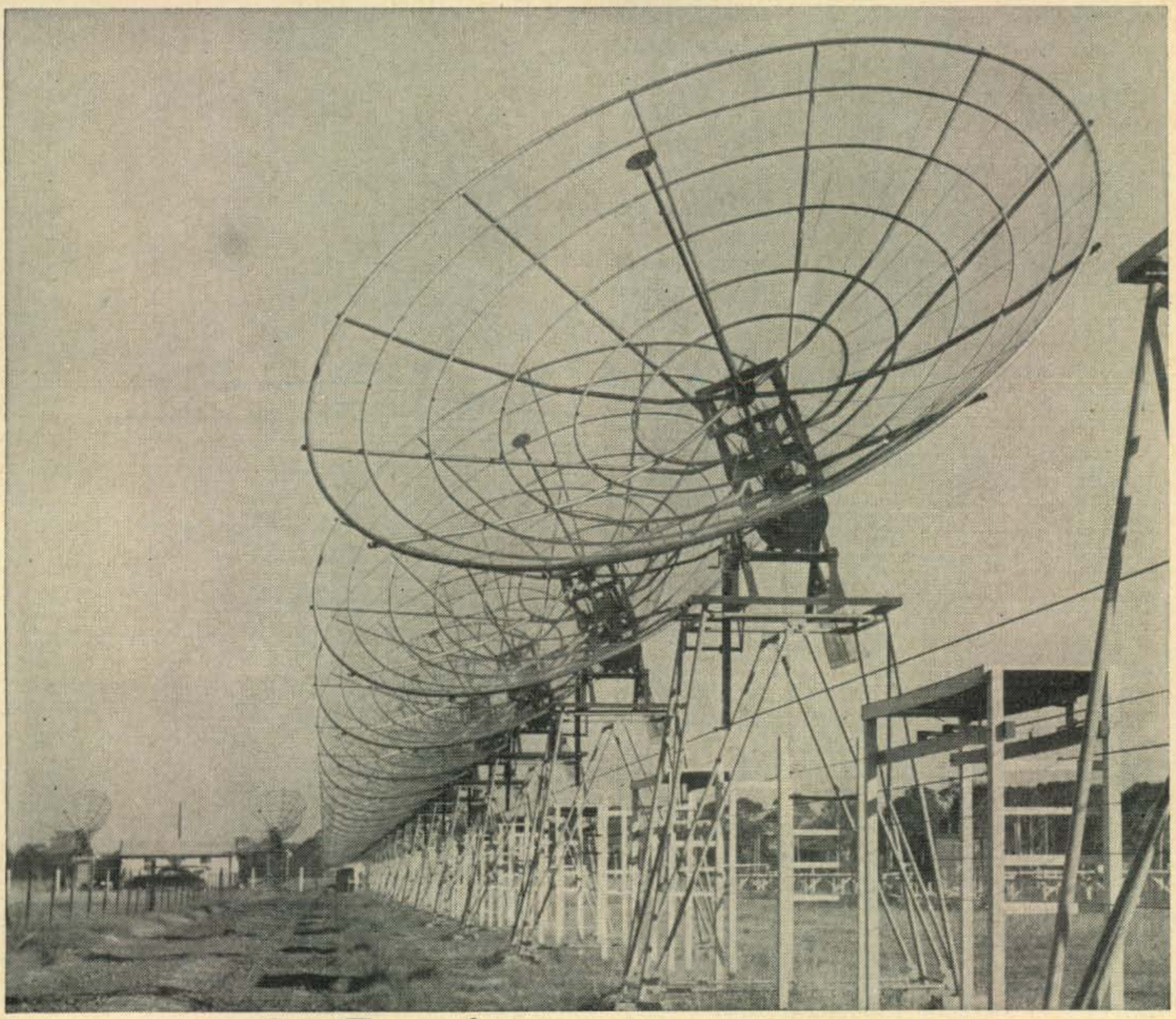
Mosley Electronics, Inc. 4610 North Lindbergh Blvd. Bridgeton, Mo.

For further information, check number 11, on page 110

Vol. 5, No. 5—May 1963

VHF AMATEUR





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Address correspondence to: Bob Brown, K2ZSQ, Editor, *The VHF Amateur*, 300 W. 43rd St., New York 36, N. Y.

Putting the Vocaline On 420 Mc

LARRY WILL, K3ADS
Box 131
Bryn Mawr, Pennsylvania

Now available inexpensively, the Vocaline 465 mc transceivers make ideal low power 420 or 432 mc ham band units. Very few real modifications are necessary and the cost is quite low.

WITH the recent shifting emphasis on Citizen's Band from the older 465 mc band to 11 meters, equipment for operation on the higher CB frequencies has fallen into the background. With this the Vocaline Radio transceivers (Models JRC-400 and JRC-425) have lately become available from private sources and mail order houses for prices anywhere from $5 to $40. With simple modifications they make excellent low power devices for the 420 mc ham band.

Changes

These modifications consist of making the antenna trimmer and long lines accessible, adding a carbon mike, and a simple receiver audio change. If 432 mc operation is desired, the task is equally as simple, since the original units were tunable from 440 to 490 mc. An insulated tool and a set of Leecher wires are all that's needed. Push- to-talk is standard in the JRC-425 and, although not a dire necessity, can be installed into the JRC-400. If you are contemplating the purchase of a Vocaline unit for conversion, might we suggest your looking into the JRC-425. If push-to-talk does become desirable, you've already saved yourself the trouble and cost of putting in the relay.

Control Access

Remove the lower portion of the cabinet and drill the left side as shown in fig. 1. The upper hole accommodates a shaft for antenna tuning and the other is an access point for adjusting the long lines oscillator. Readjusting will become important after the unit has been replaced in its case due to a capacitance effect.

On the loop assembly on the chassis, a small ceramic tubular trimmer can be noted. This is our antenna trimmer, dubbed "the screw." Fashion a turning device out of a piece of brass rod as shown in fig. 2. Then simply solder the

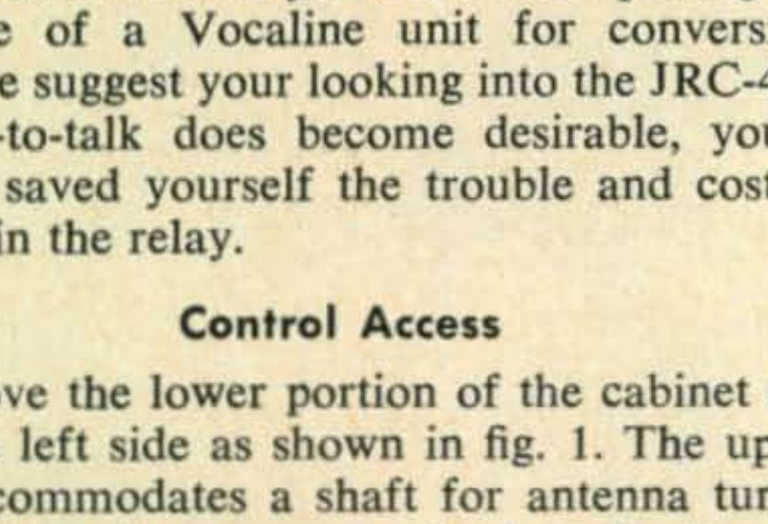


Fig. 1—Diagram showing lower portion of cabinet. Drill as indicated. Location of the carbon mike "box" is not critical, hence exact dimensions are not shown.

View of K3ADS's completed Vocaline transceiver, now modified for operation in the ¾ meter UHF band. Minibox on the left houses the carbon microphone amplifier circuit.

rod to the trimmer screw being careful not to overheat the assembly.

Increasing Modulation

The microphones supplied with these units are usually crystal or ceramic and provide a modulation level of only about 30%. This limits communication range a great deal. Use of a carbon microphone through a transformer and penlite cells (the box on the left side of the unit) substantially increases the effectiveness of modulation, especially at a distance. Location of this arrangement housing is not critical. We placed it on the left side for convenience sake. It should be noted that the return lead (pin 1 of J_2) for the microphone and relay control is connected directly to one side of the power line. Therefore it is necessary to insulate the mike jack from ground with a shoulder washer. *Use a microphone that is completely insulated.*

Electrical Modifications

Referring now to the circuit diagram as supplied with the units, we must add a .01 mf ceramic capacitor at the volume control arm to the junction of the .1 meg resistor (R_6) and the .01 mf capacitor (C_5). This increases our signal to noise ratio.

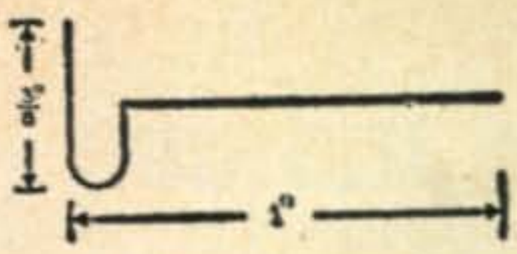


Fig. 2—Tuning rod for soldering onto the antenna trimmer for access outside the cabinet. Flatten the 1" end slightly to aid in fastening to trimmer.

Figure 3 shows the microphone circuit, as adapted for a carbon mike. The interstage transformer is used rather than a mike-to-grid transformer because the latter provides too much gain which overdrives the speech amplifier and produces distortion.

Changing the Frequency

After all the above is complete, apply a.c. power. When the "rush" is audible, plug in the 6" antenna and turn the adjusting screw on the side of the unit. A point should be found where the rush disappears or at least drops considerably. This is the "dead spot" and is very important in the tuneup, indicating that the antenna assembly is in resonance with the oscillator. Correct setting should be *just before* the rush begins to decrease in amplitude (on one side or the other of the dead spot). Remember which side you picked and *stay on that side while tuning*.[1]

Now connect a short piece of 52 ohm coax to the antenna jack and terminate it into a small 2 v. 60 ma bulb in series with the Leecher wires. *Adjust the plates closer together until the unit is transmitting inside the amateur band.* Move the plates (preferably with an insulated tool) about 1/16th inch at a time until in the TRANSMIT position; the Leecher wires indicate when the transmission is within the band. While making these adjustments, return the unit to RECEIVE occasionally and readjust the screw to the point near that dead spot.

Operation

Set up the two units, one in the house and one in the car. Proceed to drive away from the house until communications get difficult. Then stop the automobile and find a spot where the signal is sufficiently weak but still copyable. Moving the antenna just three or four inches may make a radical difference at this point. Now readjust the plates and screws *of each set* in turn for the best signals. Long "counts" are useful here. (The loop assembly should be ¼" to ⅜" from the long lines and need not be adjusted further as it isn't too critical). Repeat this procedure. When the signal is good, continue driving further away and repeat the above, bearing in mind that as the two units become closer together in frequency, the small split portion of the plates should be moved for a fine adjustment.

This procedure should be necessary only every six months or so, when the 6AF4A oscillator

[1]It may be necessary to use a particular side (in or out) in order to get *some* units in the band. Moving the screw from one side to the other changes the frequency several *megacycles*.

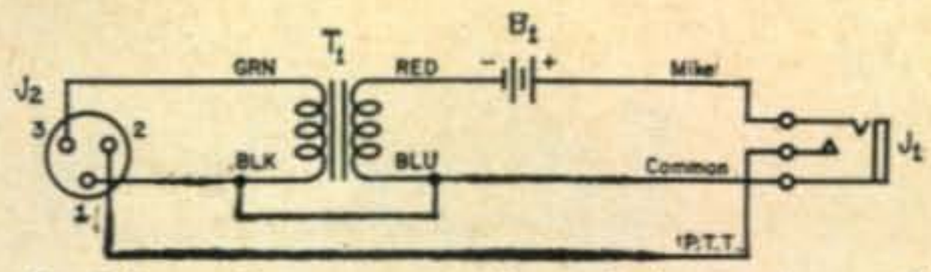


Fig. 3—Schematic representation of the carbon mike circuit as wired for push-to-talk. This circuit can be eliminated with the JRC-400 series by connecting pins 2 and 3 at J_2. Make sure both jacks are insulated above ground. Circuit can be built into a Minibox (Premier AMC-1000). Reverse battery polarity for minimum audio distortion, if conditions warrant.

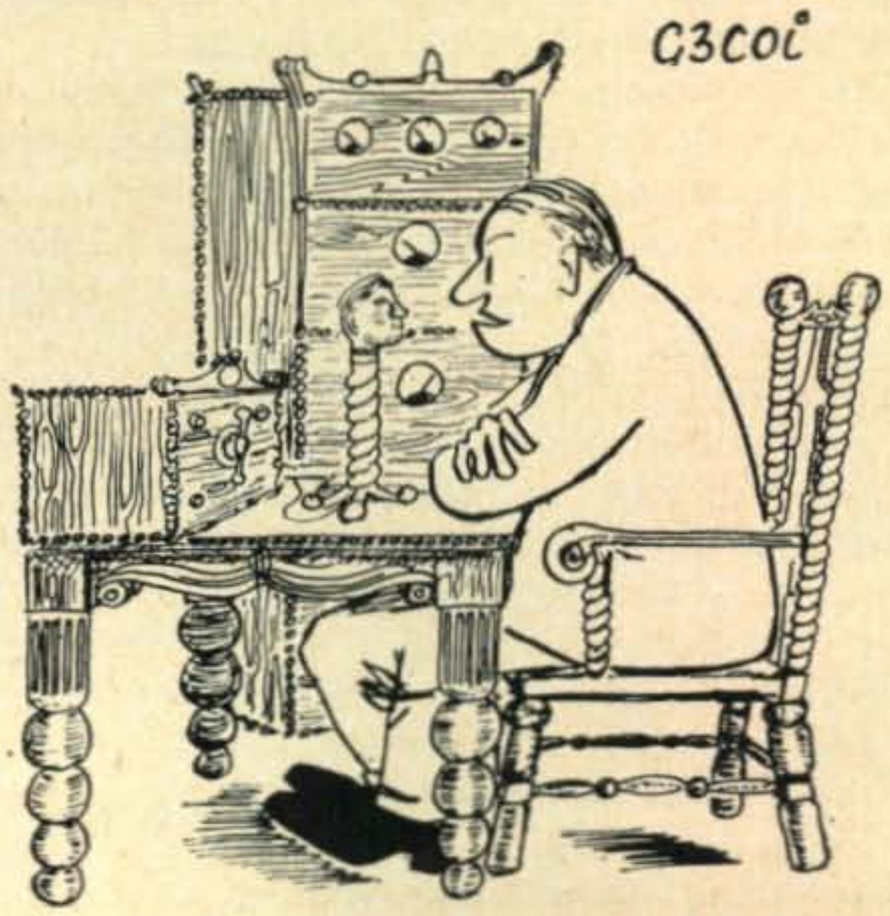
B_1—Two Burgess #7 1½ v. batteries in series.
J_1—Switchcraft C12B PL-68 receptable.
J_2—Amphenol 91-MPM-3S three conductor plug.
T_1—Merit A-2900 interstage transformer.

tends to go soft or reception indicates that replacement might be warranted. These adjustments should be left "as is" most of the time, except for the screw, which should be adjusted for maximum signal frequently. When in proper working order, the tip of a #47 pilot bulb held so it electrically touches the 6" antenna should produce a *dim* light. When the tube is unable to light the bulb, replacement is probably necessary. Note: In some units, this test may not be completely satisfactory. In such cases, two different 6AF4A tubes should be tried and the best one selected for use.

Windup

For those of you who are without a manual, I refer you to *QST*, January 1959, page 32, where the Vocaline AT-30 is discussed. It is not completely identical to the models described here, but it is similar enough to be useful. Any number of antennas will work (groundplanes, corner reflectors, etc.) with these units. Space doesn't permit our discussing them here, but feel free to drop me a line for details. Feedlines should be 300 ohm line or RG8/AU (*only*). Other smaller coaxial cables have too much loss at these frequencies. In the meantime, though, bear in mind that a ½ wave antenna at 420 mc is roughly 13". From this perhaps you can "roll your own."

So now you're on UHF! ■



". . . and my other pastime here is woodcarving . . ."

Conclusion

Getting Along with the Indians

DAVID L. HELLER, K3HNP
14 Darkleaf Lane
Levittown, Pennsylvania

In the concluding segment of this series the formation of TVI Committees is discussed. It has long been our contention that every major area should have its own TVI Committee to service viewers experiencing interference, amateurs receiving complaints, and the FCC. If you don't have these services available, read on!

We have let the feedback from the first articles of this series tell what the subject should be this month. Most of my mail has been from readers asking how to get an Interference Committee started. Here are some of my thoughts.

An Interference Committee is responsible to three groups: the FCC, licensed transmitter operators, and to those having receiver interference problems. The FCC is the primary master. All work by the Committee should be governed by the preferences of the local Commission engineer. He may desire certain reports on a Committee's work. He will send routine interference complaints to the Committee for investigation and advice, and will take strong action when Committee reports indicate the need.

The Commission receives many amateur-interference complaints, of course, but other classes of licenses cause trouble too. Police, taxi and other commercial transmitters are involved in TVI complaints, and the FCC Engineer is normally very pleased when a Committee is willing to investigate these cases.

The Committee must help the station licensees. Checks for interference are made on receipt of interference complaint either directly from the TV owner or through the FCC—or on request of the station operator. Where the transmitter is found interference-free, the situation is recorded and further corrective action is referred to the affected TV receivers. Where the transmitter is not clean, the Committee should offer a sensible program for cleaning up, and where technical assistance is needed it should be offered. The Committee may have suitable filters available for tests.

When the Committee is unsuccessful in getting the transmitter cleaned up due to lack of cooperation or improper equipment, the FCC must be informed with a complete report. Generally, Committees will suggest that interfering amateurs restrict their operating to necessary tests until they can pass inspection. Committees have no real authority to demand such restriction. but those cases of non-cooperation by amateurs are rare.

Interfering commercial stations are usually advised to obtain service within a reasonable time; except for Citizen's Band it's impractical for them to keep the station out of use. In severe cases advice should be obtained directly from the Commission.

THE NEWARK STAR-LEDGER, MARCH 1, 1963

TV viewers beef over ham operator

Did you have to settle for directions to a restaurant in Bergen County last night when you tuned in Channel 2 and settled back for an hour of Perry Mason?

Or did weather gal Carol Reed or the talking horse on "Mister Ed" seem to be giving a discourse on the care and treatment of amateur radio equipment instead of telling about high pressure areas or Ed's latest rhetorical adventures.

If you were doing your television watching in Essex County it's a good chance that that's what happened.

Angry listeners complained to The Star-Ledger last night that for the fourth straight night, between 5:30 and 9 o'clock, CBS-TV's outlet, Channel 2, was marred by frequent interruptions from a ham radio operator who apparently was conscious of the nuisance he was creating.

At one point the radio operator was heard to remark that "I guess we're giving people on TV a lot of trouble." He finally signed off for the night shortly after 9 o'clock, complaining that his receiver wasn't operating properly.

But, who knows, he may get it fixed in time to ruin your chances tonight of enjoying Route 66 or Alfred Hitchcock. Or maybe he'll just interrupt during the commercials . . .

Quote without comment. (By permission of the Newark Star Ledger, Newark, New Jersey).

The owners of radio and TV receivers can benefit considerably from a Committee's services. An experienced interference tracer can usually suggest the cause and cure of a complaint after a rapid inspection. He will know the problems frequently encountered in an area, what antennas work best, what to expect of different TV models, *etc.*

An Interference Committee is best sponsored by the local ham club or clubs, though any interested group can organize a Committee. Members must be chosen on the basis of technical competence, for a good understanding of transmitters, receivers and receiving antennas is needed for accurate analyses of complaints. Committee work is interesting, but it can be frustrating at times, and frequently involves painstaking investigative work.

Some Committees have representation from TV service and CB groups. This is desirable when such people can be found who are acceptable to the amateur groups. In any event the amateurs should keep full control of the operation.

It is desirable that at least one member of a committee have a First or Second Class Commercial license, for there are times that adjustments to commercial or CB rigs will speed investigations.

The A.R.R.L. provides a very useful portfolio of reprints and articles to clubs starting Interference Committees.

Starting Your Committee

Choose your chairman carefully, and let him decide whom he'll have serve with him. If the work load is small, he may not require regular assistance. With him decide what your scope will be, whether you will wait for complaints to be referred from the FCC, or whether you will publicize your activity and solicit complaints. Have a mailing address or phone number you can publish—the former, preferably. A club box number is fine. My Committee will not accept phone calls from anyone but licensed amateurs.

Instruct the police or sheriff how to refer complaints to you. They receive many. The newspapers and local TV stations also get complaints about amateurs.

Make up report forms for writing up all cases investigated. The forms mentioned last month have served me well; sample sets are available at nominal charge. Set up a master file (a notebook will do) to keep track of cases and their disposition.

The newly-appointed chairman should make an early appointment with the district FCC engineer, for he may have distinct preferences on handling of complaints. Regardless, it is wise to meet him and acquaint him with the planned operation.

Once your Committee is established, your methods will be adapted to local requirements. You will rapidly gain the experience required to handle routine cases with dispatch, and the occasional unusual or difficult case will be welcomed.

The first few cases can be embarrassing. But chances are they'll be completely routine, and even though you may not know yet exactly what you're doing, the complainant doesn't know it.

Don't Touch

One rule of my Committee is that the complainant's TV set may not be touched. This means we may not change channels, adjust the volume, or even touch the cabinet. All the Committee can give the TV owner is advice. He can follow it or not as he wishes.

This writer is always available for consultation on TVI and related problems. Send me your rough ones with all the information available. All I ask is a stamp for return postage—or a ham or DX license plate for the collection and please, let me know how it worked out. ■

The Parks 144-1 2 Meter Converter

BOB HEIL, K9EID

A new two meter crystal controlled converter utilizing four nuvistors complete with the power supply in a small 5 x 7" chassis has recently been introduced by Parks Electronics Laboratories of Beaverton, Oregon.

The front end uses a pair of 6CW4 nuvistors in a neutralized cascode circuit with better than 3.0 db noise figure. An overload condition here is next to impossible. The second 6CW4 grounded grid section of the cascode front end feeds the grid of the 6CW4 mixer. The plate of the mixer uses two tuned circuits feeding the i.f. strip. The mixer grid is also fed with some signal from the 6CW4 oscillator. This triode produces overtone output from a third overtone crystal. A similar oscillator was described in the February, 1963, *CQ*. It is a very stable and capable circuit for use in a receiving converter of this type.

Shielding and bypassing throughout the unit offers minimum noise, maximum gain, and cuts feed-through to a nil. Bandpass is excellent, remaining fairly uniform over the entire 144 to 148 mc region. Many tuned circuits help in aiding this situation.

The power supply uses two silicon diodes which provide ample plate supply for the nuvistors. The supply has a switch and small pilot light neatly mounted on the top deck of the self-contained converter.

Parks Electronics Laboratories also produces a 50 mc converter which is quite similar to the unit described in addition to a preamplifier for 144 mc with its own power supply. We feel that you will find the new Parks-144-1 converter an excellent buy (priced at $54.95) with its laboratory design and construction and should give you many hours of pleasure with your receiving system. ■

*VHF SSB Editor.

Parks Electronics Laboratories new 2 meter converter.

VHF SSB

ROBERT HEIL*, K9EID

JUST a few short months ago we were digging our way out of the winter snow. Now here we are getting ready to see the graduation exercises at the local high school once again. Time sure does fly by. As we stand by and watch the harmonic walk down the isle, we're suddenly aware that now our sweet little bundle in the blanket is now 6'6" and graduating into manhood.

Back home in the shack we realize that the VHF bands are graduating also. Everyone is going to surpressed carrier sideband for the ultimate in communications, with more sideband stations coming on the air every day.

One Forty-Five Point Two

Things are happening in southern Indiana and Illinois on 145.20 mc u.s.b. W9's GWL, UZL, MWK, TZB, FAH, and K9's GKR, VGM, and KNW are always in there with more coming each week. The Egyptian Electronics people monitor 145.20 mc twenty-four hours a day. If you live in the Midwest, or are traveling through, bear this in mind.

Every night at 2100 CST Smitty, WØDQY, can be heard with his C.E. 20A-Halort mixer-pair of 4X250B's smoking into two 15 element Yagis up 80'.

The Chicago two meter gang is growing! K9DTB is going into the Army, but sister K9-UUR will be holding down the station. On 145.20 mc K9ZWV and K9ZWU are quite active, being an XYL-OM team. Des, K9RVG, is just about ready to fire up.

Moving south into Louisiana, we uncover K5ZQK in Baton Rouge with his homebrew 829B two meter sideband final. Sure like to work him!

Many letters have been coming in letting us know about a new 2 meter setup. This consists of putting the new Heath HX-30 6 meter s.s.b. exciter with the 2 meter section of the SB-62 (See November 1962 *CQ*). This makes a fine combination and greatly extends the new Heath sensation. KØRIR, WA4DRJ, and K5ZIQ are now on the air in this fashion.

Introduction of a new strictly-VHF s.s.b. firm is in store. Halort Electronics, of Sparta, Illinois, is producing a two meter and a six meter 20 watt mixer (in separate cabinets) with corresponding finals running about 300 watts. K9SGD informs us that Halort also carries a complete line of Parks converters and Gain, Inc., antennas.

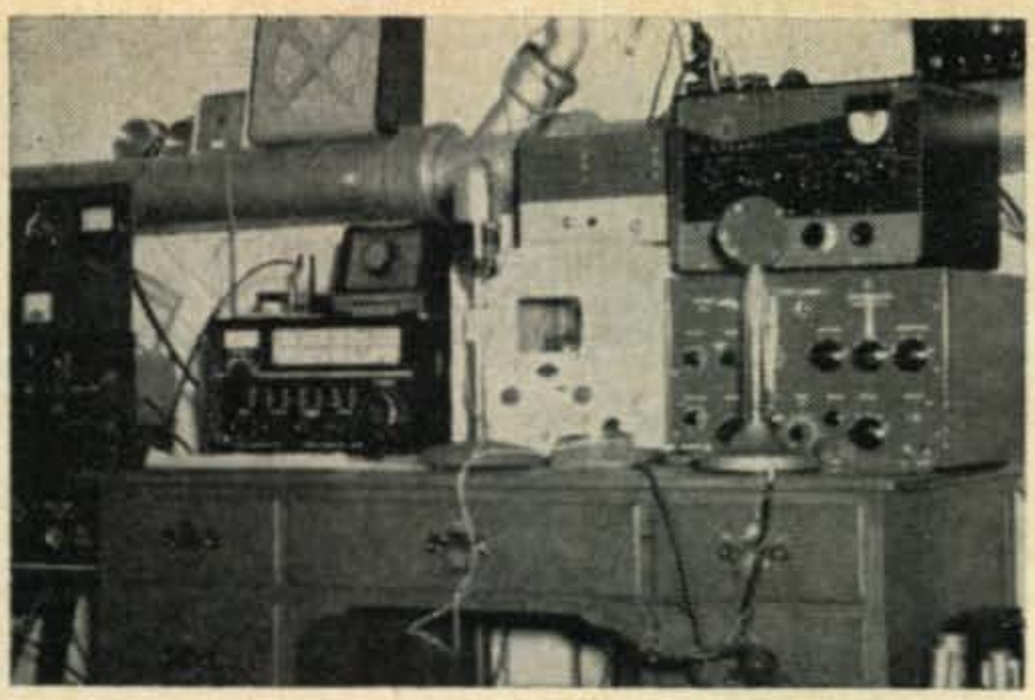
I've been corresponding with KA9FH/W4OKI in Japan, who reports using the SB-62 with his SB-10 for his VHF work. Yes, there's quite a bit of VHF s.s.b. activity in Japan! Sappora City emits with quite a few 50 mc sidebanders, while Honshu Island is packed with both 50 and 144 mc sidebanders. Just wait until that F_2 gets here!

Six Meter Sideband

The gang around Boston finally got with it

*402 Border Street, Marissa, Illinois.

Contest operating, VHF s.s.b. style at K1IGY, Boston, Massachusetts, Dick worked 288 stations in 20 ARRL sections during the January VHF Sweepstakes.



Here's another Massachusetts sidebander's shack, that of Steve Maloney, K1UAN, of Weston. Looks like he's got a good ground, eh?

and clued me in on activity up there. Have you? And what a crew they have! Here is just a partial list of active sidebanders: K1's IZM, JMM, ISR, PBE, TWX, QOG, KAS, QBP, PYI, VIV, OHU, and W1's ELU, BSY, WMO, WXX, BKI, DDF, LUN, ADE.

New York State has more sidebanders on. Bob, W2CNS, has his homebrew gallon all fired up, and Wally Cantoni, W2HVW, has an HT-37 on six now. K3QCQ in Lebanon, Pennsylvania, was the only W3 heard from this month. Bill's got 300 watts (h.b.) on 50.112 mc.

W7SBJ, in Seattle, is one of the very few heard from that way using an SB-62, plus his homebrew phasing exciter and a fine antenna. K9CZI and K9DTP need contacts into Wisconsin. Give the antenna a whirl out there and listen for them on 50.120 u.s.b. Both have excellent s.s.b. stations. K1IGY has a GSB-100, 20A, and 10B with homebrew mixers driving either his 826's or 4-400 on six. Antenna is two 6 element Yagis up one hundred feet! The long-awaited state of Nebraska is finally on the VHF s.s.b. map. K9KHW/Ø is on from Lincoln with a pair of 4X250B's into a five over five. Alva, WØEEQ, is on from Lecoma, Mo., with his new d.s.b. rig. Really does a fine job! WA5AAK has the SB-62 on from the rare state of Arkansas. WA9DTP represents Granite City, Illinois, with his 10B. KØAWX is another SB-62 owner on from Drutry, Mo.

Windup

We'll be looking for your letters and comments. Please remember that this is your column and your support is paramount. Will see you again on these pages in July. In the meantime, get in your envelopes in for the *VHF News Bulletin* and put your rig on the air for the Spring *CQ* VHF Contest, May 4-5.

73, Bob, K9EID

Write today for your copy of "The Sunspot Story, Cycle 19, The Declining Years," by CQ's own W3ASK and Stanley Leinwoll. Send $1.00 to Hal Weisner, WA2OBR, c/o The VHF Amateur, *300 W. 43rd Street, New York 36, N. Y.*

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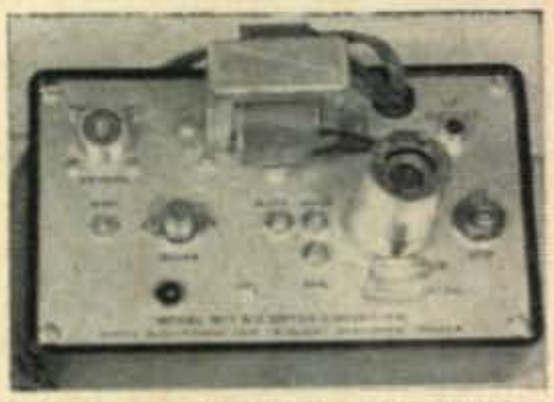

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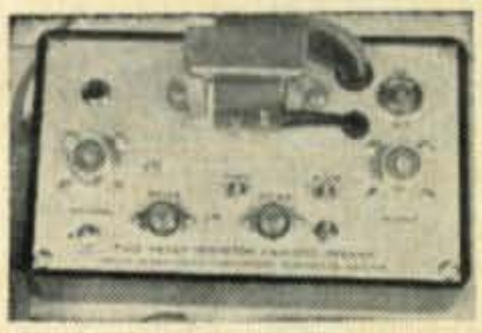

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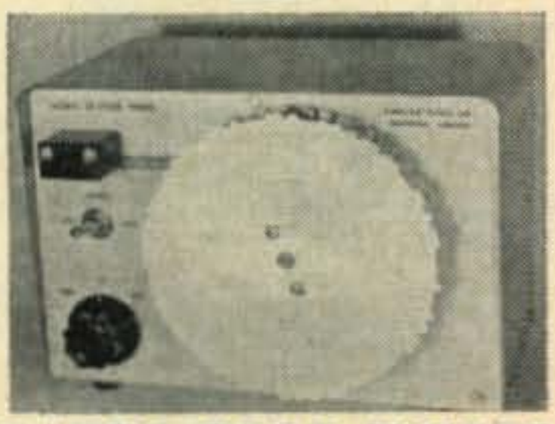

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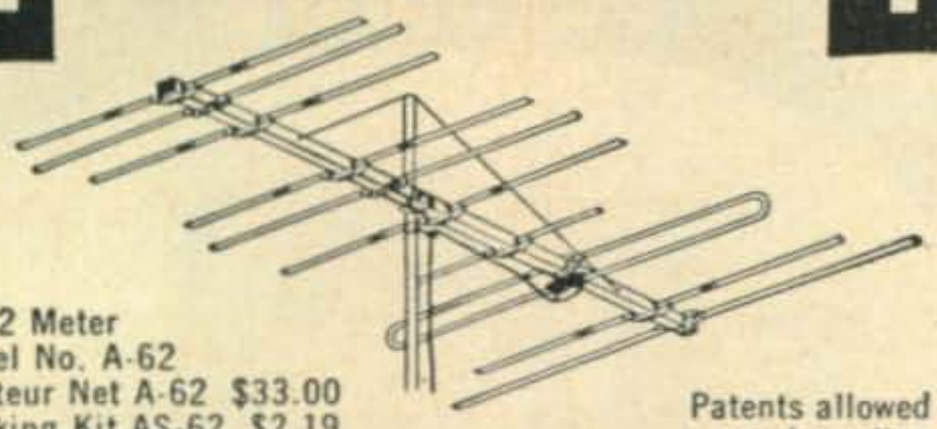

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CQ Magazine
300 W· 43 St., New York 36, N.Y.

Weekly VHF News Bulletin

In a publication such as *The VHF Amateur* we are faced with a great many production time-consumers far too numerous to mention here. The result, however, greatly offsets the lead time required which allows us to present a professionally printed magazine. Unfortunately, though, the news all too often loses its impact, due to the required preparation time.

In the months ahead we can well expect 6 meters to be at its yearly high, DX-wise. Stations such as VO1DW, VP7CX and XE1OE will be worked and heard by alert 50 mc operators all over the continent. Two meters will likewise be active with greatly improved tropospheric conditions prevailing and the upcoming various meteor showers scheduled.

When will these showers take place? What DX stations will be on the air? Who has been working them? What frequencies will they be on?

In the very near future we will begin issuing a weekly *VHF News Bulletin* as a supplement to our current VHF coverage here each month. Although it will contain up-to-date DX news and general VHF information of interest, it won't be fancy. And it may not run more than one or two sheets. But it *is* free for the asking.

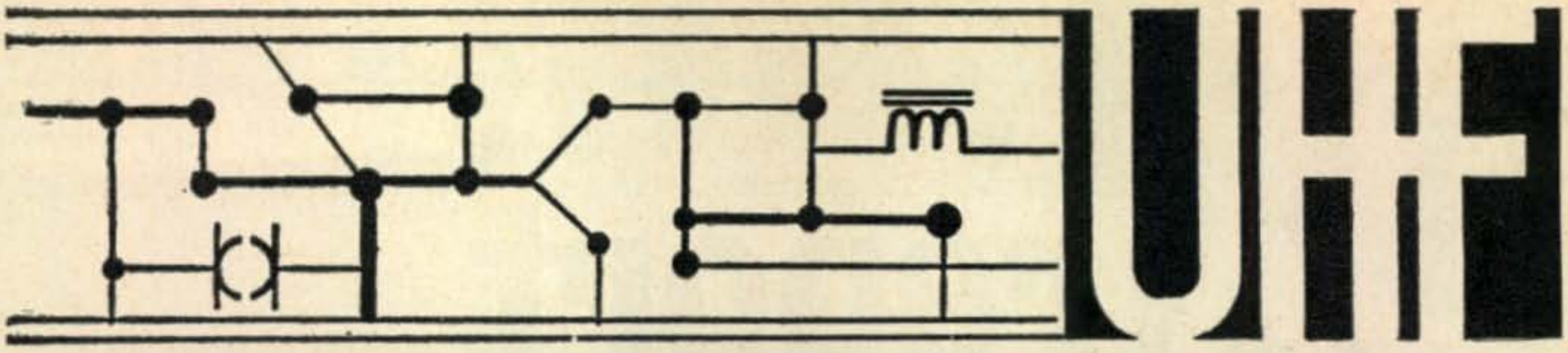
All we request is that you send us a supply of self-addressed stamped envelopes in which we can mail you your *VHF News Bulletin* regularly. Send us as many large (legal size) envelopes as you can, making sure that each one has a 5¢ stamp attached; every envelope will represent one issue. We'll let you know if your supply is running out. If you have a friend who you feel might also enjoy getting a weekly, send in some s.a.s.e.'s for him, too.

Publication will get underway very shortly, and you won't want to miss any issues. Send your self-addressed stamped envelopes today to:

VHF News Bulletin
c/o Bob Brown, K2ZSQ
The VHF Amateur
300 West 43rd Street
New York 36, New York

■

"Just QRX while I check to see if we have QSO'd before . . ."



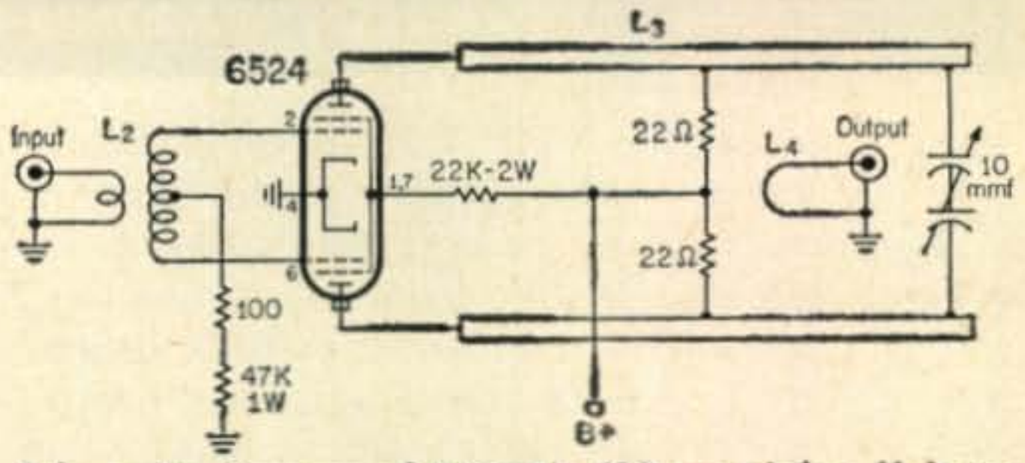
UHF

ALLEN KATZ*, K2UYH

WITH all the hustle nowadays to develop new techniques, many an old idea can get lost in the shuffle. I wonder how many members of the present UHF fraternity remember the pole oscillator. I must admit this idea originated a 'little' before my time. This little gimmick used to be quite popular on the old 2½ meter band in years past. The idea was to get the transmitter up at the antenna to avoid feedline losses. A massive control cable then was fed into the shack for remote control operation.

Mounting high power finals such as those in use today on the UHF bands could be a bit difficult, but it has been proven effective in the past and for that reason is worth considering for the future. If you were to measure the losses between a kilowatt final on 432 mc through 100' of RG8/U and the antenna, I'm sure you would see our point. Losses at these frequencies through long lengths of coaxial cables can prove a real stumbling block.

However impractical the mounting of finals on poles, fastening converters or preamplifiers at that point is both simple and practical. A nuvistorized preamp can be made small enough to fit along with a coaxial relay into one of those plastic containers used to keep food fresh. Such a pole mounted preamp can provide real gain on the UHF frequencies, where the transmission line loss might otherwise prove fatal at the receiver. The transistorized preamplifier described by W2VCG in the November 1962 *CQ* is ideal for this type of project. In fact, the installation of an amplifier on the pole instead of just the preamp can outperform an parametric amplifier where equally long feedlines exist. If you desire optimum receiver results with a minimum of expense, why not give the 'ol pole' a try?



Schematic diagram of K9DTB's 432 mc tripler. Unit can be constructed in a 3 x 4 x 10" chassis.

L_1—2 t. #20 e. ½" dia.
L_2—4 t. #16 e. ½" dia., ½" long, c.t.
L_3—copper strap 3½" long. Fasten to heat dissipating connectors and give a 90 degree twist ½" from plate end. ¾" spacing.
L_4—#20 e., 1" long, ⅜" wide.

Letters

New APX-6 conversion from W9JIY . . . "I changed the second detector in the a.m. APX-6 conversion circuit to a 6BN6 gated beam discriminator using a standard TV type circuit. Since the APX-6's modification is a combination of a.m. and f.m., you can then adjust the buzz control for either or both. It seems to work 100% better on signal strength than the old version, and also eliminated our trouble with radar signals and automobile noise. Tests proved about a two S unit increase." *Since the APX-6 is part f.m. and broader than a barn door to begin with, there is nothing to lose by going to complete f.m. We haven't tried Win's conversion yet, but I'm sure it'll work out fine. For conversion details write: Winfred B. Clark, W9JIY, 2130 S. Arlington Avenue, Indianapolis 3, Indiana.*

Amateur TV in Texas via W5HPT . . . "Ham TV here is lonesome as all get out. I put the rig on once or twice a month, point the camera out the window, and send myself a picture. No one else seems interested in this phase of amateur radio here. Presently I am using a Companion transmitter with modified plate and grid lines, bringing it up to 440 mc. Previously I used a 5894 final with grid video modulation, with better results. Also have a homebrew flying spot scanner per *Radio-TV News* in the early 1950's. I have two more ATJ's, both with ikes (one with lens), which I'd like to trade or sell. With the new FCC ruling allowing one kilowatt on 432 mc, maybe amateur TV will 'go' yet." *I know what you mean, Vic. We have the same problem here. It seems the old ATJ is always making one-way transmissions. The trouble is that everyone is too spread out. What we need is an all-inclusive amateur TV network. Anyone interested?*

Illinois UHF news from Phil Caruso, K9DTB . . . "We are trying to get UHF going here in Villa Park, Illinois, on 432 mc. Recently completed a 432 mc tripler which may be of interest to your readers who are presently equipped with 144 mc gear." *Right you are, Phil. Tripler note: The need for good shielding cannot be overstressed. Phil's tripler is especially nice be-*

[*Continued on page 84*]

*48 Cumberland Avenue, Verona, New Jersey.

DX report

DANIEL L. PARNES*, WA2DMQ ROBERT M. BROWN*, K2ZSQ

At long last the VHF DX season is finally at hand. With the Spring and Summer come meteor showers, tropospheric inversions, Sporadic *E* skip, tropospheric ducting, and just plain good ground wave, which all add up to greatly improved communications over a much extended path. We might suggest your putting in a little more time at the rig in the months to come; you'll find that time well invested.

With the shifting accent now leaning heavier than ever on distant communications, every effort should be made toward getting maximum performance out of that rig. Antenna work, addition of a tuned preamplifier on the converter, speech clipper, etc., should be well underway by now. If you haven't "revamped" yet, get busy!

We've been contemplating for some time running a series of articles on propagation, the means by which your signal travels at various times. In the weeks ahead more and more use will be made of these various layers of the ionosphere, troposphere, etc. DX'ing, however, is not merely the *use* of a presented propagation, for unless there is some element of actual understanding, maximum use can never fully be made. This brings to light the frequent cases of amateurs who go their merry way working great numbers of stations, but lacking a fundamental working knowledge of electronics. As long as the equipment is in good working order, all is okay. But should something go wrong, and the rig is inoperable, these amateurs lack the "know-how" to get it back on the air. So it goes with VHF propagation. Propagational conditions on the bands above 50 mc are unsteady to say the least, making it a must for the serious DX enthusiast to know what the alternatives are. Why are we able to work W9's one day and W3's the next? Of course you know the answer, but just try to explain it to a newcomer who doesn't. Caught?

We'd like to know your feelings on the matter. Space in a magazine is always at a premium, so we want to be assured that we're not wasting it. Most likely this series would appear in this column regularly.

Two Meters

Gary Weaver, WA6NMT, of Hermosa Beach,

Here's what *The VHF Amateur* 12 Hour VHF Contest did to Dale Holland's shack in Webb City, Michigan. As soon as the receiver at WØRXM went on . . .

California, is busy revamping the station for the Summer 144 mc schedules anticipated. Present rig, Gary writes, runs 150 watts. If you'd like to be on the list, drop a line to WA6NMT at 1315 Corona Street . . . K2RRM, W3BDK, and W1GB/1 are all part of Jack Mays' (WA2HJG) report for the month. Jack would appreciate schedules into Lebanon, New Jersey. His antenna? 11 element CushCraft.

"Well, we got *them* going," says K1RTS about those ARC-4's. "Now on 2 meters with these units are KN1WLE, KN1WJA, K1RWH, KN1UVR, K1MJC, KN1UWR and K1RTS. Up and coming here in the Waterbury, Connecticut area are KN1ZCK, K1TFD, and K1MVZ." *Good luck, fellas!*

Ten elements just 15' off the ground really do the job in North Riverside, Illinois. Bob Plechaty, K9CGD, reports contacts with K9OYD, K8ZQE, W8BPG, K9FZD, W9DHQ, W9GDT, W9JFP, K9AYV and K9ZFX. Write 2427 Westover Avenue for schedules. Bob needs Wisc., Mich., So. Ill., Iowa, Ohio, and Tennessee.

Daily schedules with K4IXL on 144.090 mc are kept by Jack Woodruff, W8PT, in Benton Harbor, Michigan. Jack reports that that's a distance of over 1180 miles. A meteor schedule

*300 West 43rd Street, New York 36, New York.

with Maine 144.082 is desired at W8PT, so you Yankees write to R.R. #3, Box 157 soon!

Six Meters

Los Gatos, California: John Lee, W6YKS, writes, "Thought I would drop a line to fill you in on activities in the Bay area. DX hasn't been too good, but there have been a few openings. K7URG (Ariz.) was worked by K6QMD and K6HXY on March 3, and KØZZM, K7UNK, WØEEH, K5KKU, K7BHF, and have been heard earlier in the season.

"More and more stations getting on six meter c.w. (I'm not alone anymore). Have worked K6QMD, K6HXY, WA6QEJ, K6QHC, K6HPB, and heard others on c.w. in this area. Rig here is 75 watts. Sideband representatives are K6QHC, K6HCP, K6HUM, WA6FJX, WA6QEJ.

"I think there is more listening and building going on here with the VHF boys than anything else, so when the band opens, look out for the KW's!" *Sure will, John!*

St. Thomas, Virgin Islands: Randy Blodgett, KV4CQ, sends along a beautiful postcard with, "A month of wonderful weather. Six meters here is not too good, although some Puerto Rican stations have been heard. KV4CY (K1PWW) is building a place next to mine. We'll be trying for a club next Fall here, starting with about a dozen hams. But we'll push 6 meters!" *You do that Randy, and keep us posted!*

Cedar Falls, Iowa: Ken Satterlee, WØDLB, writes, "Just read your request for a note from readers, so here goes . . , Very little activity in this area as quite a few rigs are in the construction stages. I've just built a couple nuvistor converters for 6 and 2, so maybe I'll start hearing things. Would sure like to get some schedules." *Okay, Ken. All you Iowa boys (and others) write today to: 4323 Clearview Drive.*

Six Meter DX Notes

. . . *WA6YZH*—Richard Metlen, of Culver City, California, recently worked WA6WFG/7 in Utah; KØFTG, Colorado; and K7EZP, Oregon. Dick's antenna, a ground plane. Dick's comment: "Bad month!" . . . *WA4IRX*—Al Hemmalin, of Memphis, Tennessee, heard K7QCX, K7NBD, K7URG, K4KEX, and XE1OE, but no contacts yet . . . *K9DTB*—Phil is looking for skeds on 50 mi c.w. and s.s.b. He runs 200 watts into an 8 element beam on 6. Write Phil Caruso, K9DTB, 531 South Illinois Street, Villa Park, Illinois, for skeds . . .*K4WYC*—Mike Davis, of Raleigh, North Carolina, is also looking for skeds, inasmuch as he just got on the air. Mike formally operated from KR6QW. Write 2214 Brewer Street.

QRT

Be sure to write today for Spring *CQ* Contest logs (if you haven't done so already) and also request DX Reporting Forms. Note: These forms will also be used for our new *VHF News Bulletin* (see details this issue). 73, Bob, K2ZSQ

Come up out of the noise . . . let 'em know you're around with a new 60 Watt **Clegg Thor** 6 Transceiver. Sound good? Here's the rest of the story.

TRANSMITTER FEATURES:

- FULL 60 watts input on phone or CW to 6883 final.
- BUILT-IN VFO that automatically tracks the receiver or switches to crystal control for fixed frequency operation.
- ALL stages broadbanded for easy QSY.
- SPEECH-CLIPPING FOR MAXIMUM talk power.
- BUILT-IN PUSH-TO-TALK.
- BUILT-IN Keying relay for clean chirpless keying.

MOBILE OPERATION

Now you can run a mobile "power house" using your new **Thor** 6 transceiver and model 418 transistorized, mobile modulator/PWR Sup.

RECEIVER FEATURES:

- NUVISTORIZED front end for extreme sensitivity at lowest noise level.
- CRYSTAL lattice filter for maximum selectivity.
- BFO with variable carrier injection for SSB reception.
- ULTRA-STABLE tuneable local oscillator that also functions as VFO for transmitter.
- EXCELLENT audio characteristics. 2 watts into 3.2 ohm speaker.
- Sharp reduction in spurious responses and cross modulation.
- Effective noise limiter.

The **Thor** 6 is of two unit construction . . . The Receiver—RF unit for convenient desk top operation and the modulator/pwr. sup. unit may be located remotely by a 10' interconnecting cable (provided).

Amateur net price for AC operation $349.95.
12V DC Mod./Pwr. Sup. $100.

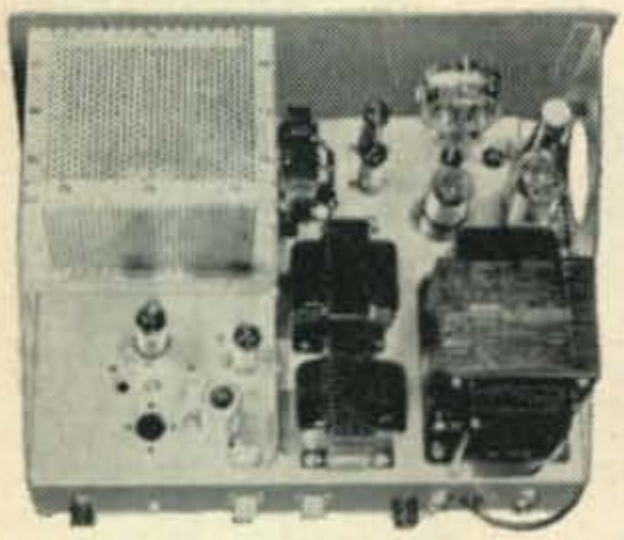
Clegg

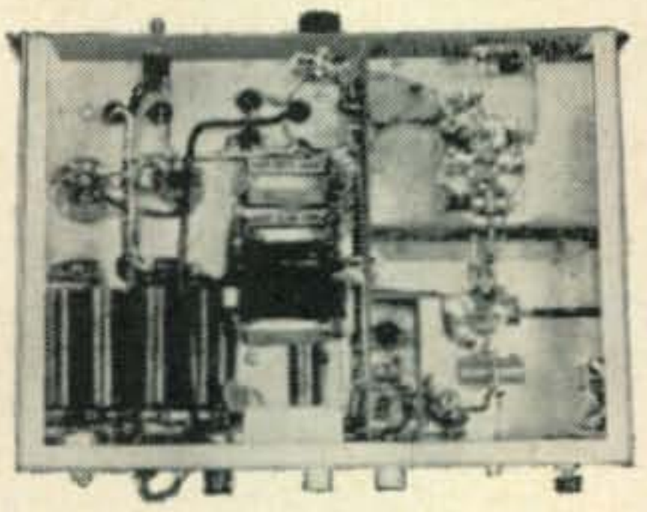
See your Distributor · or write for information.

LABORATORIES
DIVISION OF TRANSISTOR DEVICES, INC.
RT. 53, MT. TABOR, N. J.
OAkwood 7-6800

For further information, check number 2, on page 110

175 WATTS SSB ON SIX METERS with P & H 6-150 TRANSMITTING CONVERTER





Here's the simple, easy way to go VHF on SIX METERS! Just feed the 20 meter output of your present SSB, AM or CW exciter into the P&H 6-150 and you have 175 Watts PEP on SIX METERS, either crystal or VFO controlled, depending on your exciter features. Resistive Pi-Pad and switchable Half-Power Pad permits operation with any 5 to 100 Watt exciter. Since the 6-150 is a high stability mixing device, the output signal stability is the same as that of your exciter. Uses a 6CX8 crystal oscillator/ Class A buffer; a 6360 Balanced Mixer and a NEW AMPEREX 8117 push-pull output tube. Power input to 8117 final: 175 Watts PEP on SSB, 165 Watts CW, 90 Watts linear AM. Entire chassis and all shielding is COPPER PLATED. Output jack provided to furnish oscillator signal injection for receiving converter. Quiet 200 CFM forced-air cooling. 50-70 ohm input and output impedances. Husky built-in power supply has three separate rectifiers and filter combinations. Meter reads; PA GRID, PA PLATE and RELATIVE RF OUTPUT. Modernistic curved corner grey cabinet; 9" X 15" X 10½". The P&H 6-150 is so thoroughly shielded, by-passed and parasitic-free that it operates as smoothly as an 80 meter transmitter. COMING SOON! THE P&H 2-150 FOR TWO METERS!

Complete — With Built-in Power Supply, All Tubes and Crystal, for Only $299.95

WRITE FOR LITERATURE

P & H ELECTRONICS INC.
424 Columbia , Lafayette , Ind.

For further information, check number 4, on page 110

UHF [*from page 81*]
cause it can be easily built into a 3 x 4 x 10" chassis. Bottom plate serves as shield. It should also be mentioned that the 5894, 829B and 832 can also be made to operate in Phil's circuit.

UHF Roundup

. . . *K6HEP*—Berkeley, California, plans to be on 1215 mc by early June. Write for skeds . . . *K1RTS*—is looking for 220 mc skeds from his Waterbury, Conn., QTH . . . *W8PT*—is holding the following skeds: W9OKB (432.004 mc) at 2030 EST Mon., W9BTI (432.020) at 2200 EST Mon., W8RQI (432.055 mc) at 2130 EST Tue. and Thurs; and K9UIF (432.057 mc) daily. Also active in Jack's area (Benton Harbor, Mich.) are W9AAG, K9DLJ and W9NAU . . . *K7BBO and K7HSD*—have completed construction of a large cylindrical parabolic antenna similar to the one described in the February 1961 edition of *The VHF Amateur*. Both are in Tacoma, Washington, and looking for skeds.

Odds "n" Ends

. . . *W2TND*—Elizabeth, N. J., is the latest to join the ranks of the New Jersey APX-6 Net with his APX-6 . . . *W6IEY*—completed mounting ring for a 4' dish he will use along with his APX-6 and xtal controlled transmitter as per W6AJF. Dick has heard both WA6HIT and W6JWL in LA. He has just joined the local M.A.R.S. net which operates on 432 and 1296 mc.! *How's that for a step in the right direction!*

APX-6 Antenna Connectors

Veterans Salvage Company, 78-21 Avenue, Paterson, New Jersey, still has HM connectors available for the APX-6. If you need these useful HM's, send Dave $1.25 each and he'll speed 'em off to you. To save postage, drop in on Dave in person with 90¢. Either way, they're going fast.

73, Allen, K2UYH

Cover Story

THE shot on our cover page this month is surely enough to make any truly authentic UHF man turn green with envy. But put away your fears as this is *not* one of K2UYH's latest contrivances, but rather a crossed-grating interferometer located in Sydney, Australia.

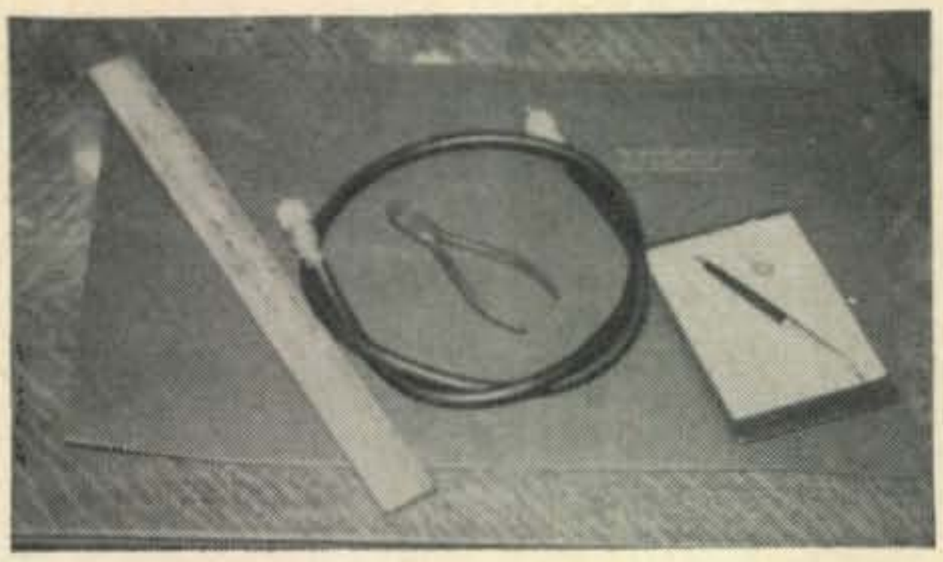
The entire system consists of 64 separate parabolic antennas, each 19 feet in diameter and mounted on its own equatorial axis. This instrument "sees" only about 1% of the Sun's surface at a time through a small scanning spot that rotates its "sight" over the Sun's surface progressively (much as a scene is scanned in TV practice). Hence we have a radio picture of the Sun.

Frequency of operation? 1,444.444 mc. ■

(photo courtesy of WB2AAI)

Get That Feedline *Right*

WILLIAM ROBERTS, W9HOV
1209 West 74th Street
Chicago, Illinois



How many times have you wanted that perfectly related line to the antenna or wanted to have a ½ wave stub or myriads of other things that need accurate lengths to make them highly successful? We believe that every ham has a better than average grasp of mathematics, but it's tough after a hard day at the office to come home and get out the *Handbook* and figure the perfect lengths.

On the VHF-UHF scene there are no tolerances that present themselves on the lower frequencies.

If you have a system that isn't working properly, take a bit of time and measure it *carefully*. Chances are that there are discrepancies. If there are, trim it up some Saturday afternoon. We have the feeling that it'll be worth your while. ■

TABLE OF COAX LENGTHS

Freq. in Mc	1λ free space	300Ω 1λ open line	½λ RG8/U	½λ free space	300Ω ½λ open line	½λ RG8/U
50.0	236.2	193.68	155.89	118.1	96.84	77.94
50.5	233.8	191.71	154.31	116.9	95.85	77.16
51.0	231.5	189.83	152.79	115.8	94.91	76.40
51.5	229.3	187.94	151.34	114.7	93.97	75.67
144.0	82.00	67.25	54.13	41.0	33.62	27.07
144.5	81.82	67.01	53.94	40.9	33.51	26.97
145.0	81.44	66.78	53.76	40.7	33.39	26.88
145.5	81.15	66.54	53.58	40.6	33.27	26.78
146.0	80.87	66.25	53.37	40.4	33.13	26.68
146.5	80.58	66.06	53.17	40.3	33.03	26.59
147.0	80.30	65.75	52.98	40.2	32.87	26.44
147.5	80.04	65.58	52.79	40.0	32.79	26.39
220.0	53.67	44.01	35.42	26.8	22.00	17.71
220.5	53.55	43.91	35.34	26.7	21.96	17.67
221.0	53.42	43.80	35.26	26.7	21.90	17.63
221.5	53.30	43.71	35.18	26.6	21.86	17.59
222.0	53.18	43.61	35.10	26.6	21.81	17.55
222.5	53.07	43.51	35.03	26.5	21.76	17.51
223.0	52.95	43.42	34.95	26.5	21.71	17.48
223.5	52.83	43.32	34.87	26.4	21.66	17.44
224.0	52.71	43.22	34.79	26.5	21.61	17.40
224.5	52.60	43.13	34.71	26.3	21.57	17.36
225.0	52.48	43.03	34.63	26.3	21.52	17.32
420.0	28.11	23.05	18.55	14.06	11.53	9.28
422.5	27.94	22.91	18.44	13.97	11.45	9.22
425.0	27.78	22.78	18.33	13.89	11.39	9.17
427.5	27.62	22.65	18.23	13.81	11.33	9.12
430.0	27.46	22.52	18.13	13.73	11.26	9.07
432.5	27.30	22.38	18.02	13.65	11.19	9.01
435.0	27.14	22.25	17.91	13.57	11.13	8.96

Cable figures are based on a velocity factor of .66. 300 Ohm Cable are based on a velocity factor of .82. Half waves based on electrical length—no end effects have been figured.

THE BIG WHEELS* ARE ROLLING!

Cush-Craft offers "New Dimension" to Mobile and Fixed Station Communication in Amateur and Commercial Services.

* . . . the brain child of Dr. Robert Mellen and Carl Milner plus the production know-how of Cush Craft now presents this new VHF-UHF antenna. This new clover leaf antenna gives fantastic performance: omni-directional, it has horizontal polarization and extremely low Q. This results in improved band width, ease of matching and large "capture area." Dual stacked, Big Wheel gain figures (in all directions) compare favorably with the 7 element Yagi in its favored direction.

Pattern: 360 horizontal, variations of ± 2DB or less
Band Width: SWR 1 : 1.2 or less over 4 Mc
Gain: Single bay — approx. DB over Halo

PRICES

¾ meter Model No. ABW — 420 — $ 8.95
1¼ meter Model No. ABW — 220 — $10.95
2 meter Model No. ABW — 144 — $12.95

SEE YOUR DISTRIBUTOR
OR WRITE CUSHCRAFT DEPT C.

Cush Craft 621 Hayward Street Manchester, N. H.

For further information, check number 48, on page 110

6 METER BARGAIN

6 meter, 150 mw., 4 channel, transistorized transmitter with AM modulator. Complete with transistors and 50.5 mc. crystal. Requires only 12 volts at approx. 35 ma. Ideal for walkie-talkie or get 10 to 15 mile range with a beam. "Only $14.95 ppd. while they last"

VANGUARD ELECTRONIC LABS Dept. Q-5
190-48 99th Ave. Hollis 23, N. Y.

WANT MORE VALUE FOR YOUR DOLLAR?

LO NOISE—2.5DB
HI OVERLOAD QUALITY PERFORMANCE

Model C61—6 Meter Converter $28.50
Model PS4—Matching Power Supply 9.75
Model P62—6 Meter Preamp 9.75
Model C23—2 Meter Converter 34.25
Model P25—2 Meter Preamp 9.75

6 METER NUVISTOR CONVERTER
$28.50

AMPLIDYNE LABS
KINGS PARK LI NY P.O. Box 673

FANTASTIC SALE

6 Meter Converter, $8.00 postpaid. Complete with 3 high frequency transistors and 49.4 Mc. crystal for output in broadcast band or 36 Mc. crystal for output in 14-18 Mc. band. Low noise and better than 1 microvolt sensitivity. Operates on 6-12 V. D.C.

Limited quantity—Send Your Order Today—Dept. Q-5

VANGUARD ELECTRONIC LABS
190-48 99th Ave. Hollis 23, N. Y.

If I owned a Poly-Comm would I have to buy a VFO?

NO! It's built-in

A microphone?

NO! It's furnished

A mounting bracket?

NO! It's furnished

An AC/DC power supply?

NO! It's built-in

POLY-COMM®

for 2 or 6

What's the inside story?

Maximum Performance!

FEATURING • Dual NuVistor Pre amp/RF for .1 μv for 6 db. S + N/N • Noise figure better than 4 db • Mini-load VFO for ultra stable transmit and receive • Noise limiting that will amaze you • RF output at least 10W on 6, 6W on 2 • Illuminated "S" meter that doubles for tune-up • Heavy gauge perforated steel case • Handcrafted teflon wiring throughout.

What's the cost?

POLY-COMM "2" **$349.50** complete

POLY-COMM "6" **$329.50** complete

and there's NO EXTRA CHARGE FOR CD UNITS!

Sounds like a good value, tell me more!

Gladly, just send in the coupon.

Please send complete data on: QS-5
☐ Poly-comm "6" ☐ Poly-comm "2"

NAME _____

ADDRESS _____

CITY _____ STATE _____

Intended use _____

POLYTRONICS LAB inc. 388 Getty Avenue CLIFTON, NEW JERSEY

For further information, check number 53, on page 110

Armed Forces Day [*from page 28*]

	NSS	4012.5, 7380, 14480
	AIR	7305
190335 GMT (2135 CST)	A5USA (Texas)	4025
	AG4AA (Texas)	4455
190335 GMT (1935 PST)	A6USA	6997.5
190335 GMT (1935 PST)	AG6AA	7832.5
	NPG	4001.5, 7455

Military-to-Amateur Test

Military stations WAR, A6USA, NSS, NPG, AIR, and AG6AA will be on the Air from 181500GMT (1100 EDST, 0700 PST) to 190500 GMT (0100 EDST, 2100 PST) on 18 May 1963 to contact and test with amateur radio stations. Amateur Contacts will be discontinued from 190245 GMT to 190400 GMT to allow the Armed Forces Day c.w. and RTTY broadcast competition as scheduled above.

Station	*Military Freq.*	*Appropriate Amateur Bands (Mc)*
WAR	4001.5 (c.w.)	3.5 — 3.8
	4020* (a.m.)	3.8 — 4.0
	6992.5 (c.w.)	7.0 — 7.2
	7325* (c.w.)	7.2 — 7.3
	14405* (u.s.b.)	14.2 —14.35
A6USA	3347 (c.w.)	3.5 — 3.8
	4025* (a.m.)	3.8 — 4.0
NSS	3385 (c.w.)	3.5 — 3.65
	4015 (c.w.)	3.65— 3.8
	6970 (c.w.)	7.0 — 7.1
	7301 (c.w.)	7.1 — 7.2
	13992 (c.w.)	14.0 —14.2
	4040* (a.m.)	3.8 — 4.0
		7.2 — 7.3
	14385 (s.s.b.)	14.2 —14.35
	4012.5 (RTTY)	3.5 — 3.8
	7380 (RTTY)	7.0 — 7.2
	14480 (RTTY)	14.0 —14.2
NPG	4005 (c.w.)	3.5 — 3.8
	7301.5 (c.w.)	7.0 — 7.2
	13975.5 (c.w.)	14.0 —14.2
	4045* (a.m.)	3.8 — 4.0
		7.2 — 7.3
	7385 (s.s.b.)	14.2 —14.35
	4001.5 (RTTY)	3.5 — 3.8
	7375† (RTTY until 0200 GMT)	7.0 — 7.2
	7455† (RTTY after 0200 GMT	7.0 — 7.2
AIR	3397.5 (c.w.)	3.5 — 3.8
	6997.5 (c.w.)	7.0 — 7.2
	13995 (c.w.)	14.0 —14.2
	20994 (c.w.)	21.0 —21.25
	7305 (l.s.b.)	7.2 — 7.3
	14397 (u.s.b.)	14.2 —14.35
	7315 (RTTY)	7.0 — 7.2
AG6AA	3365 (c.w.)	3.5 — 3.8
	7308 (l.s.b.)	7.2 — 7.3
	14353.5 (u.s.b.)	14.2 —14.35
	7832.5 (RTTY)	7.0 — 7.2

*Operators transmitting on these frequencies will listen for a.m. and s.s.b. signals within the appropriate bands.
†NPG will conduct Military to amateur RTTY contacts on 7375 kc until 0200 GMT (1800 PST). At 0200 GMT NPG will shift this circuit to 7455 kc for RTTY contacts after this time and for the RTTY broadcast.

U.S.-Canada Border [*from page 35*]

Canadians Visiting the U.S.

Table II lists the frequency allocations available to Canadians visiting the United States under the terms of the treaty and in accordance with U.S. regulations. Maximum d.c. power input 1000 watts except as indicated. 160 meter restrictions are somewhat complicated so far as Canadian regulations. Canada's banned countries list differs from that of the United States as does the list of countries with whom the exchange of third party traffic is permissible.

Phone Results

[*from page 51*]

Africa

South Africa

ZS5OA	**17,922**	**91**	**37**	**50**
	(ZS5OA, ZS5OB)			

Asia

Israel

4X4HW	**18,760**	**113**	**14**	**42**
	(Club Station)			

Japan

JA6YAX	**4080**	**54**	**15**	**19**
	(Club Station)			
KA2MA	**100,152**	**341**	**34**	**73**
	(K8GSR, K6SWH)			

Ryukyu Is.

KR6MD	**49,200**	**264**	**31**	**49**
	(Club Station)			

U.S.S.R.

Armenia

UG6KAA	5304	59	9	25
	(Club Station)			

Asiatic

UA9KPW	**17,995**	**114**	**19**	**42**
	(UA9OI, UA9PL)			
UA9KQA	17,113	103	21	48
	(Club Station)			
UA9KSA	7260	84	9	24
	(Club Station)			

Azerbaijan

UD6KAC	**14,892**	**88**	**19**	**49**
	(Club Station)			

Kazakh

UL7KBK	1356	47	13	23
	(Club Station)			

Europe

Czechoslovakia

OK3KGI	**20,003**	**190**	**22**	**61**
	(Club Station)			

England

G3HTA	**38,478**	**178**	**35**	**86**
	(G3HTA, G3JW)			

Finland

OH2AA	**75,440**	**360**	**38**	**126**
	(OH2SB, OH2MK)			

Germany

DJ3VM	**345,486**	**660**	**60**	**153**
	(DJ3VM, DL1CR, DL1CX, DL3AO, DJ4LI, DJ1BP, DJ3JZ)			
DL1JW	282,100	538	69	148
	(DL1KB, DL1JW)			
DLØOS	**78,142**	**258**	**56**	**122**
	(DJ2HH, DJ4PE, DJ7JC)			
DLØDX	11,592	138	25	59
	(DJ5OW, DJ6MQ, DJ6RZ, DL9ZX)			
DL4SE	**150,480**	**461**	**53**	**118**
	(DL4SE, DL4FX, DL4FC)			
DL5AC	107,583	361	41	100
	(DL5AC, DL1TA, DL4SF, DL4UC)			
DL4PP	103,180	334	39	101
	(Club Station)			
DL5BR	26,544	163	31	81
	(DL5DQ, DL4AA)			

Hungary

HA5KDF	2520	59	9	21
	(Club Station)			

Iceland

TF2WGU	**18,081**	**179**	**15**	**34**
	(TF2WGU, TF2WHB, TF2WHJ)			

Netherlands

PI1PT	3456	67	11	37
	(Club Station)			

Luxembourg

LX3QT	**35,595**	**287**	**28**	**77**
	(DJ6QT)			

Northern Ireland

GI3CDF	**101,552**	**374**	**53**	**123**
	(GI3CDF, GI3CVH, GI3FJA, GI3ILV)			

Norway

LA1H	**4797**	**118**	**8**	**33**
	(Club Station)			

Portugal

CT1YE	**260,064**	**657**	**54**	**162**
	(CT1YE, CT1EY)			

San Marino

DJ1ZG/M1	**429,111**	**1051**	**60**	**147**
	(DJ1ZG, DJ3JV, DJ3SM, DL9XO)			

Sweden

SM5AZU	**19,552**	**141**	**30**	**64**
	(SM5AZU, SM5ATN, SM5BGM)			
SL5AB	9982	129	17	45
	(SM5ACQ, SM5CZK, SM5TY, SM6CQU)			
SL6BH	912	22	10	14
	(SM6AMD, SM6CKU)			

Switzerland

HB9IV	**39,644**	**202**	**34**	**72**
	(HB9IV, HB9ADP)			
4U1ITU	21,568	143	22	42
	(Club Station)			

U.S.S.R. (Club Stations)

European

UA1KBW	**61,608**	**295**	**29**	**73**
UA6KAF	34,916	229	25	61
UA3KYA	10,967	158	14	49
UA3KFB	1350	34	8	17

Estonia

UR2KAT	**5940**	**119**	**10**	**35**
UR2KAE	4429	97	10	33

Latvia

UQ2KAM	**2366**	**90**	**6**	**20**

Lithuania

UP2KNP	**129,276**	**529**	**47**	**142**

Ukraine

UB5KED	**18,827**	**163**	**19**	**48**
UB5KDS	6940	107	14	31
UB5KSP	3060	69	9	25
UB5KBG	286	24	4	9

Oceania

Hawaii

W4GFB/KH6	**167,090**	**526**	**44**	**66**
	(W4GFB, W3WDI, W7UXP)			

South America

Uruguay

CX2CO	**991,728**	**1184**	**92**	**199**
	(CX2CO, CX7CO)			

MULTI-OPERATOR

Multi-Transmitter

North America

W3MSK	**547,768**	**673**	**95**	**204**
	(W3MSK, W3TMZ, W3ZKH, K3EST, K3NZV, W4IYR)			
K6EVR	**255,744**	**436**	**74**	**148**
	(K6EVR, W6GFE)			
K6EXO	71,120	199	51	89
	(K6EXO,K6YRA)			

Europe

DLØWW	**361,616**	**685**	**67**	**166**
	(Club Station)			
OH5SM	**305,545**	**881**	**64**	**201**
	(OH5SM, OH5NW, OH5NQ, OH2CN)			
GB2SM	**198,449**	**545**	**52**	**139**
	(Science Museum)			
I1SF	**69,836**	**264**	**42**	**116**
	(I1SF, I1DH, I1KQ)			
OH1AA	27,784	266	22	70
	(Club Station)			

Oceania

KG6FAE	**81,231**	**664**	**40**	**59**
	(Club Station)			

Our thanks to the following who took time out to send us a report on their limited operation for checking purposes.

CR7IZ, F8YO, G3MWG, OLU, HK1AKL, JA6HW, JA8BBM, SW, OH1TY, OK1VB, OZ5JT, OZ7KV, TG5WF, UL7AQL, UM8KAG, VE4SD, VK3BW, HL, YV5AIP, AQC, BBU, K1ADY, W1GYE, QCO, TZ, W2GT, PEO, K5MUX, W5PGG, W8FTQ, BRS24550.

DX [*from page 55*]

agers a little more consideration. They give freely of their operating time to help their fellow DXers. The least we can do to show our appreciation in making the job a little easier is by cooperating and not make it costly for them.

Do you ever take a minute out to drop the QSL Manager a note telling him how much you appreciate his service? I think we tend to take these things for granted. This might be a good time to take pen in hand and let these fellows know we really do appreciate their time and effort. While you have your pen out, a letter of appreciation to your district QSL Bureau might be in order as well.

EL3A via W3NNC.
GC8KS via G8KS.
G3OHM, G3RSR, GB3SB J. K. Harvey, 2A The Avenue, Rubery, Nr.
HI8XAG via W2CTN.
ex HS5OSQ via KH6FBJ.
JA1EEB/KG6 Yuu Tsuboi, JA1EEB, 102 Ota Iwatsuki, Saitama, Japan.
KG6SX via KH6FBJ.
KH6FBJ Lt. H.C. Sherrof, Jr., USN, 1132 McMorris Dr. Honolulu 18, Hawaii.
KX6AE Box 472, Navy 824, FPO, San Francisco, Calif.
LA9RG/P via LA8LF.
PX1BE via PAØBEA, F. v. Rossum, Elegaststraat, 15-III Amsterdam, The Netherlands.
SM3 via Box 78, Gavle, Sweden.
UA1CK/UAØ
UA1CK/UH8 Anatoly Moskalenko, UA2AO, P. O. Box 77, Kaliningrad obl. USSR.
VP5BP via VE3CJ.
VQ8BI all QSL direct to: VQ8BI (including the W4BPD operation).
W9WNV/KG6R via W9VZP, RFD 1, Delavan, Wis.
ex-XW8AS via KH6FBJ.
YA1AW via K5YYP.
5N2JKO via W4MCM.
5N2NFS via K9QIZ.
9G1EO via VE4OX.

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☐ Rush newest reconditioned gear bulletin

For further information, check number 47, on page 110

geographical delineations are concerned. Therefore, if you contemplate 160 meter operation in the States, the best thing is to refer to a copy of the FCC Rules prior to the trip.

The 75 meter segment from 3.9 to 4.0 mc can be used within the continental United States. This segment is restricted in Guam and certain other offshore possessions, however, so anyone contemplating such visits should consult the Rules directly.

The procedure for obtaining a U.S. permit is nearly identical to that previously described for obtaining a Canadian permit. The first step is to write, at least six weeks in advance, for a permit application, Form 410. This request should be addressed to: Secretary, Federal Communications Commission, Washington 25, D.C.

In addition, you should send for a copy of Volume VI of the FCC Rules. Enclose $1.25 in U.S. funds or Canadian equivalent and send with your request to: Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

FCC Form 410 is nearly identical with the Canadian Form 2190 and is illustrated in fig. 2. The Canadian amateur completes Form 410 as illustrated omitting his license class where "License No." is indicated. The form should specify the area to be visited or the general itinerary, if traveling, as well as the anticipated period of the visit.

U.S. regulations require that the Engineer-in-Charge of each FCC district be notified in writing prior to portable or mobile operation in his district when the station will be away from its permanent location for more than 48 hours. This rule *does* apply to visitors from Canada. Therefore, be sure to write to the Engineer-in-Charge of the FCC districts you will pass through before your trip and advise him of the anticipated period of operation. If possible, give him an address where you can be reached in the United States. If this is impractical, provide as much information as possible. If you are touring and anticipate passing through a number of FCC districts, you may send copies of one itinerary to each of the engineers-in-charge. ■

Coax Switches [*from page 37*]

are steady-state maximum values which may be exceeded intermittently, as during voice modulation.

Electrical measurements indicated performance well within specifications. Insertion loss was found too low to measure and cross-talk leakage averaged —55 d.b. or better at 30 mc for all models.

For those who have invested a sizeable sum in commercially-built gear and who would like to realize the convenience of line switching together with a neat appearance, these units are relatively low in cost. Amateur net prices for Waters coaxial switches are as follows: Model 335, $12.95; Model 336, $11.45; Model 341, $11.45 —*W2AEF*

Pentagrid Mixer [*from page 44*]

handbooks, provided that the tuned output circuit has low impedance at 60 cycles. Clipping in the grid circuits will show up as "overmodulation on negative peaks," except when the higher frequency signal is applied to grid #1, and is also large in amplitude. Tests were therefore made with both input signals applied to grid #3 in turn.

The testing resulted in the following conclusion: For type 6SA7 pentagrid mixer with a plate supply of 300 volts, with 100 volts on grid #2-4, and with a cathode bias resistor of 390 ohms, the signal applied to either grid #1 or to grid #3 should *never exceed 2.5 volts rms,* (or 3.5 volts peak). Under these conditions there is no clipping, no grid #1 current, and very little distortion in the output. This is shown in fig. 1. All of the advantages of pentagrid mixers are had, and the two special problems are taken care of. Other pentagrid type tubes were not available when the above tests were made, but they all appear to be similar, to judge from their rated operating conditions in tube charts.

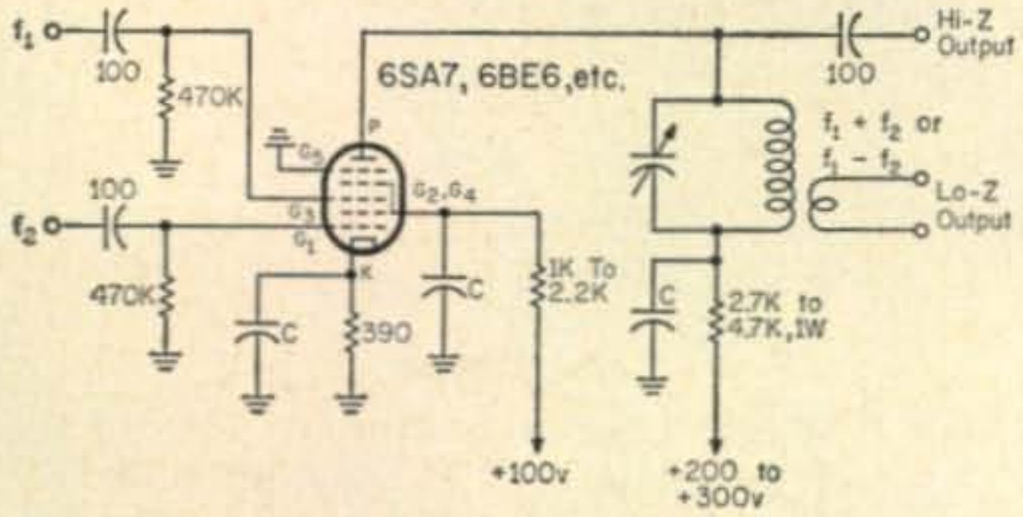

Fig. 1—An operational pentagrid mixer circuit is shown above. Bypass capacitors C can be 0.005 mf if all frequencies involved are higher than 400 kc. If the output frequency is within 25% of f_1 or f_2, a double tuned output circuit is recommended. All resistors are ½ watt unless otherwise noted and all capacitors are in mmf.

Measuring Signal Input Voltages

If a vacuum tube voltmeter with a probe for measuring r.f. voltages is available, checking the signal voltages applied to grids #1 and #3 is easy. Remove the tube from its socket and insert the probe pin or lead into the socket hole corresponding to the desired grid. If the signal sources are tuned circuits, these will have to be retrimmed a little to compensate for the difference between the interelectrode capacity of the tube and that of the probe. Do not try to use a long wire to a v.t.v.m. having no probe. Long means anything more three inches.

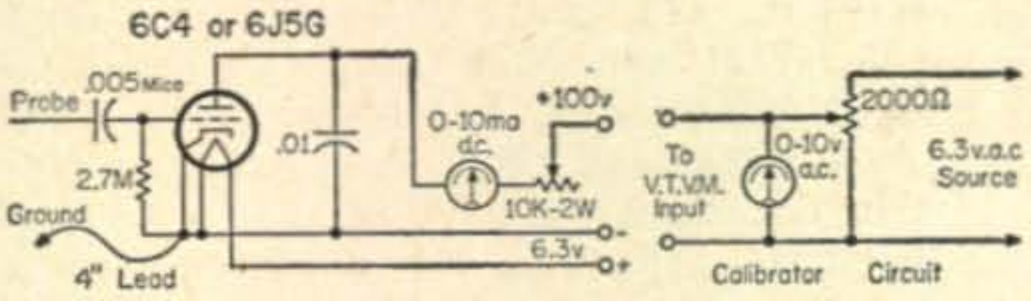

Fig. 2—A simple v.t.v.m. that may be used to measure the signal voltages at the #1 and #3 grids. Also shown is a simple set-up that may be used for calibration

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D.C. Power supply. Mfg. for the Mars for RDZ receiver. Input 115 VAC 50/60 CY. Output 300 VDC at 200 Ma. well filtered thru two 8 HY 200 ma. chokes and two 10 mfd 600 oil caps. Also has a 150 VDC supply thru a VR 150. 6.3 VCT at 10 amps and 12 vac at 3amps. Meas. 5½ x 9 x 17. Complete with tubes. Shpg. Wt., 64 lbs. Cat No. C-6262.....$14.95

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Horiz. amp. freq. response 3 cps to 1.0 mc within—6 db.
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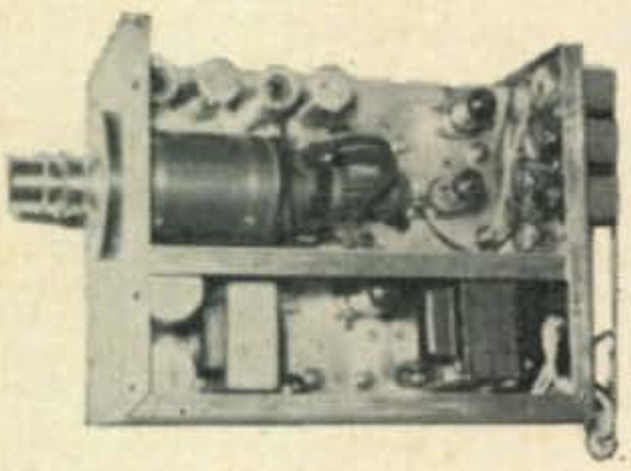

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If a regular v.t.v.m. is unavailable, a simple one can be lashed up in a few minutes. A suggested circuit is shown in fig. 2. The tube and socket can be the probe, so there are no chassis mounting problems. The grid coupling capacitor serves as the actual probe wire. The plate milliammeter can be calibrated for 2.5 volts and similar values by using 60-cycle voltages from the heater circuit, as shown. In a simple v.t.v.m. like this the meter 'reads backwards,' going down instead of up when an a.c. voltage is measured. It is not practical for measuring voltages more than about 8 volts, and the calibration is non linear (i.e., half a given meter reading does not mean twice the a.c. voltage). However, it is sufficient for the job at hand, and its simplicity and economy are attractive. ■

Contest Calendar [*from page 56*]

Evans covered it in his March Column, p. 63. Check back if you want to add another certificate to your collection.

Your logs go to: The CARC, c/o John Laney, K4BAI, 3500 14th Avenue, Columbus, Georgia, deadline is May 31.

OZ CCA

C.W.

Starts: 1200 GMT Saturday, May 11
Ends: 2400 GMT Sunday, May 12

Phone

Starts: 1200 GMT Saturday, May 18
Ends: 2400 GMT Sunday, May 19

The OZ CCA is a world wide DX contest with extra points given for working OX, OY and OZ stations.

It was thoroughly covered in last month's CALENDAR.

Logs go to: The E.D.R. Contest Committee, P. O. Box 335, Aalborg, Denmark. Mailing deadline is June 15th.

Starts: 2300 GMT Friday, May 31
Ends: 0600 GMT Monday, June 3

Certificate Hunters Club/Hunt The Hunters

Hunters the world-over will be afforded an opportunity to rack up contacts for credit toward awards during the annual CHC/HTH QSO Party to be held 2300 GMT Friday, May 31 through 0600 GMT Monday, June 3, 1963.

CHCers will call "CQ CHC"; others call "CQ HTH." CHCers will give QSO number, report, handle, CHC number, state and county, or country and political sub-divsion, for DXers.

HTHers will give QSO number, report, handle/HTH, and QTH identity as above.

POINTS AND SCORING SYSTEM:

(CHC HTH and SWL compete separately)

CHCers: Each QSO, CHC to CHC is *one* point; CHC to HTH is *two* points and any YL contact is one *additional* point, whether YL CHC or HTH.

HTHers: Each QSO with CHC is *three* points and QSO with YL CHC is *two additional* points.

HTH to HTH contacts do not count for party purposes.

Same station, either CHC or HTH, may be contacted on different bands or by different modes, in which case it may be considered a new contact. A.m. and s.s.b. are considered different modes.

The following constitute score multipliers: Continents; Countries; VE/VO Provinces; U.S. States. Your own state and country count. For final score *add* the total number of multipliers and *multiply* this by total points scored under above formula.

SUGGESTED FREQUENCIES (*plus or minus 10 kc*)
CW: 3575; 7030 primary night; 14075 primary daytime; 21090; 28090. AM: 3810; 7235; 14250; 21330; 28800 (DX on 3675; 7075; 14250; 21330; 28800). SSB: 3990; 7205; 14340; 28690 (DX on 3775; 7090; 14340; 21440; 28690). VHF: 50.35.

AWARDS

Awards will be given to 1st, 2nd and 3rd place winners of country, VE Province and U.S. States. Logs must be postmarked to K6BX by August 1, 1963, Box 3885, Bonita, Calif. Logs may be used for HTH awards.

Ed. Note

The USSR information was received too late for last month's CALENDAR, but since the rules are the same as last year, with one exception; the single band classification is now for 3.5 mc only, not too much was lost. Also note that logs go to Box 88, not Box 101 as last year.

No word from the Bermuda boys regarding their "Country Club" contest usually held during the middle weeks in May. Last year's rules appeared in the May '62 issue.

Boy! we could use a vacation to Bermuda. Those un-tallied Russian logs, my poor aching eye-balls.

73 for now, Frank, W1WY

Prop. [*from page 58*]

technique based on an electronic computer program. It is expected that this will result in greater accuracy in mapping the world charts of ionospheric conditions published each month by CRPL. The charts were previously mapped manually. (See last month's cover).

The computer-derived propagation charts are now published monthly by CRPL in a booklet entitled *CRPL Ionospheric Predictions*. This replaces the *Basic Radio Propagation Predictions (CRPL-D Series)*, which previously had been published since 1945. The new series of monthly propagation charts can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. The price each month is 15 cents, or an annual subscription of 12 issues can be ordered for $1.50 ($2.00 to foreign countries).

A companion Handbook, also recently published by CRPL, describes methods for using the new propagation charts as a basis for calculating frequency predictions for specific circuits. This new publication, entitled *NBS Handbook 90*,

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10 to 17 mc Fund	4.50	4.00	3.35
2 to 2.9 mc.	4.50	4.00	3.35
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50 to 80 mc. F.M.	6.00	5.50	5.00
1.0 mc. to 2.99 mc.	8.50	7.50	6.50

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Handbook for CRPL Ionospheric Predictions, can also be obtained from the Superintendent of Documents. The price for the new Handbook is 40 cents a copy.

The *CQ* Propagation Charts contained in this month's column include predictions for short-skip openings between distances of 50 and 2300 miles for May and June, as well as forecasts centered on Hawaii and Alaska. DX Propagation Charts for May appeared in last month's column. Beginning this month, the *CQ* Propagation Charts will be based upon the computer-derived basic data appearing in the new CRPL Ionospheric Predictions series, and will be calculated according to the instructions contained in the NBS Handbook 90. 73, George, W3ASK

Space [*from page 59*]

this is the story of Martin Alter. But it is also the story of America's future, for it will be the Martin Alters of today who tomorrow will be leading this country's race into the heavens.

Bits and Pieces

On January 4, 1963 radio contact with the MARINER II Venus probe was finally lost. The last signals were received from the spacecraft when it was well beyond Venus, and about *54.3 million miles* from the earth. This establishes a new distance record for radio communications. This record was accomplished with a 3-watt transmitter aboard the spacecraft operating on 960 mc. As MARINER II passed near the planet Venus, it transmitted back to earth important data which is now being used to unlock some of the secrets of Venus' unusual atmosphere.

Among several space age projects being considered by the Space Communication Group of the Radio Society of Great Britain is a moon-bounce experiment planned for this coming summer. A group of v.h.f. amateurs have offered to design and build the transmitter, while other groups will make available a parametric amplifier and a 6DS4 type Nuvistor converter, and will also construct and erect the necessary antenna array. Transmission will be on the 2 meter band, and the exact frequency will be announced in the near future.

Another project being considered by the RSGB gang is the building of a small transistorized transmitter which will be sent aloft in a balloon from London. It is planned to launch the balloon-borne transmitter as one of the events of the Radio Communication Exhibit to be held in London this coming fall. The transmitter will probably operate on the 2 meter band. From an altitude of several dozen miles, its signal should be received over a wide area including several European countries.

The example given in April's column for the calculated received signal-to-noise ratio from the OSCAR III satellite seems to have caused some confusion. The receiver noise figure of 0 db mentioned in the example was meant only as a ref-

erence, *not* as a necessary design criterion for the receiver. The 26 db signal-to-noise ratio calculated for a 0 db noise figure would be equivalent to a 20 db ratio for a receiver with a conventional noise figure of 6 db, or a 23 db ratio for a receiver having a 3 db noise figure (for example, a parametric amplifier).

73, George, W3ASK

D.C. to D.C. Converters [*from page 30*]

transistors conduct. The input current will go up to approximately 150 milliamperes and stay there until the short is removed or S_1 is opened. If the jumper is removed the unit will immediately start and operate normally. If the unit is in a very low ambient temperature it might be necessary to flip S_1 off and then back on to allow the lamp resistance to decrease to a proper value to furnish sufficient cold starting bias.

Rectifier Circuit

A bridge rectifier circuit is used on the secondary side of the supply with the low voltage coming from the center-tap of the secondary winding. There are several reasons for using a bridge rather than an ordinary full-wave rectifier. One of the most important is that the full-wave center-tapped rectifier using two diodes would need twice as many turns on the secondary for the same high voltage output. That would mean, of course, that the transformer would be much larger. In addition to this the low voltage would have to come from a voltage divider across the high voltage supply and would result in poor low voltage regulation. The full-wave bridge requires four diodes rather than the two required for the other type of circuit. However, the p.i.v. rating necessary for the bridge is only one half that necessary for the two diode circuit so there should not be a great deal of difference in the overall cost of diodes for the two circuits.

Current flow in the high voltage full-wave bridge is as follows. When terminal 7 of the transformer is negative with respect to terminal 9 current flows from terminal 7 through CR_1, ground, the high voltage load, and through CR_4 to terminal 9. When terminal 9 swings negative with respect to terminal 7 the path is through CR_3, ground, the high voltage load, and through CR_2 to terminal 7. The low voltage supply is simply a center-tapped, two diode full-wave rectifier circuit. The current flow is from the two ends of the transformer alternately through CR_1 and CR_3, the low voltage load, and through filter resistors R_3 and R_4 to the center-tap.

The rectifiers CR_1, CR_2, CR_3, and CR_4 are GE 1N1695 silicon diodes rated at 400 p.i.v. and 600 milliamperes. Capacitor C_4 is 22 microfarads and rated at 400 v.d.c. Capacitors C_5 and C_6 are the two sections of a dual unit rated at 200 v.d.c., 10 microfarads and 20 microfarads respectively. Capacitor C_3 is a buffer capacitor for suppressing voltage transients due to the switching of the transistors. It is 0.005 microfarads and rated at 1000 w.v.d.c. ■

[*To Be Continued*]

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For further information, check number 26, on page 110

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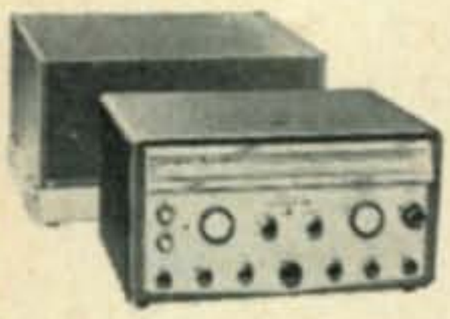

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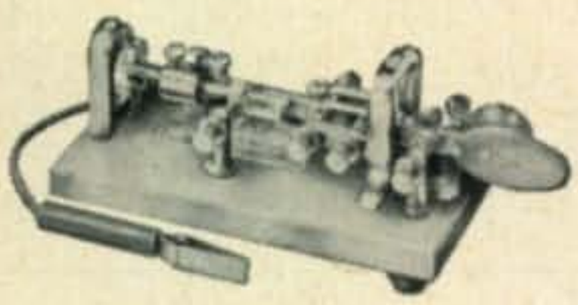

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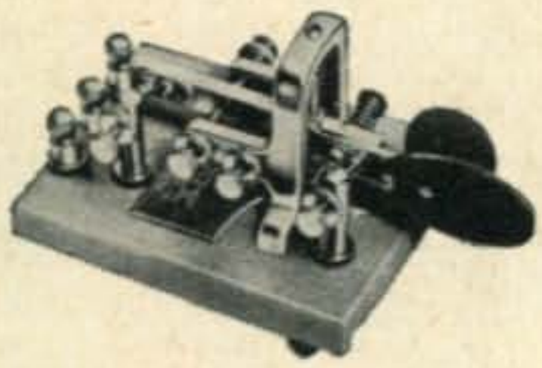

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Ham Clinic [*from page 60*]

coupled through a 10 mmf capacitor to the hot side of the volume control R_{62} or to pin 7 of V_{13}. This improvement may not be technically blessed by the manufacturer, but it works.

Key Click Filter—A key click filter which will work fine with the HX-10 and other transmitters having the same type of keying is shown in fig. 1. It was submitted by W6SAW. Thanks Herb. Adjust the 5k pot for minimum clix.

Transistors for Super-regen—A number of letters have been received complaining that the writers could not find the SB-100 for construction of the Super-regen 10 m. receiver shown in Nov. '62 *CQ*. KØZPR tells us that the T-2163 (Philco) transistor works better than the SB-100 and is available from Allied Radio for 99¢. Thanks Vern.

HT-41—"I own an HT-41 linear which has been giving me good service until I installed it in another QTH. Now there is a slight amount of TVI on our TV set. Although I have had no complaints from the neighbors, I *could* be interfering with them. Any hints?"

I'll bet your ground lead is a multiple of one-quarter wavelength at the offending frequency on which you are operating. Bond all equipment together with short leads and avoid that ¼ multiple length. An inexpensive low pass filter may also clear up your trouble. The HT-41 is a good set—we receive very few requests for technical assistance on it, other than how to feed it with a set other than the HT-37 for which it was designed.

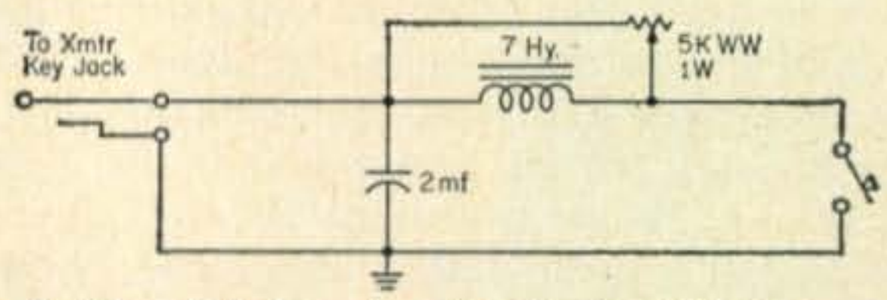

Fig. 1—Key click filter for the Heath HX-10 Marauder Transmitter.

Swan Info Needed—We have received many requests from the owners of Swan transceivers (single band) for multi-band conversion. Any one have such information? We certainly would like to publish it here!

KWM-1 to 75 Meters—"In what issue of *CQ* did the article appear giving modification information on the KWM-1 to 75 meters?"

How often do we get this question! It was not in *CQ*, it was in *QST* for May 1959, page 22. For a DX adapter for the KWM-1 see Stoner's *New Sideband Handbook* (Cowan, $3.00).

Thirty

Although available column space does not permit me to give you a first-hand description of my travels overseas, I must say that everywhere I go in Europe, the Middle East and Africa I have been truly welcome. Little did I know that so many hams over here manage to read *CQ* and, of course, HAM CLINIC. However, I am partial to Switzerland and Swiss hams. How anyone could be more hospitable, I do not know.

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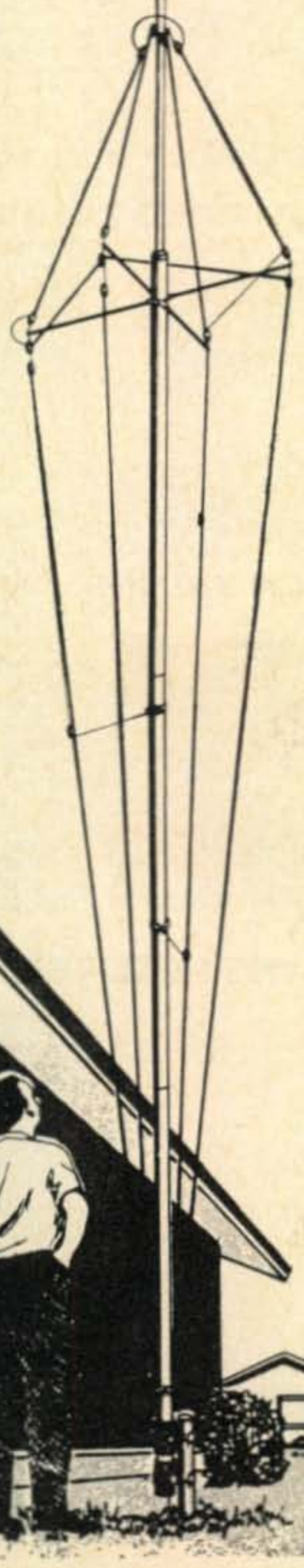

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Maximum Power 1kw, AM; 2kw PEP
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SWR . . Less than 2:1 at resonance
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Ground Plane Req. . Copper Plated 6' Ground Rod (not supplied)

Mechanical Specifications:

Max. Wind Survival . . 40 MPH Self Supporting (100 MPH Guyed)
Construction . . . . . 2" to 7/16" Aluminum 6063 T832 Alloy
Wire Elements . . . . . 7-24 Copper Clad Steel
Insulators . . . . . Ceramic and Injection Molded Plastic
Overall Height . . . . . 36'6" Phone; 38' CW
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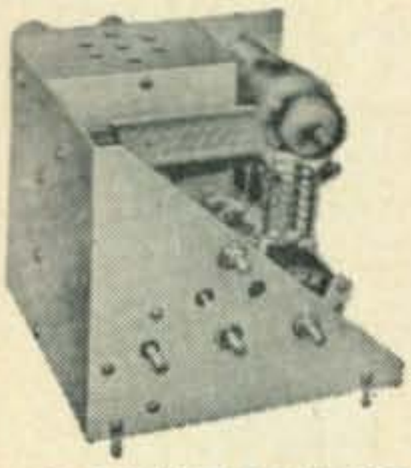

Model 504C exciter unit makes transmission on either the 80-40-20-15 or 10 meter bands available at the flip of a switch. An ideal driver for Class "C" or linear amplifiers, the frequency multiplier may also be used as a low power transmitter when equipped with appropriate accessories. Operation requires 6 to 10 volts driving power from an external crystal oscillator or VFO between frequency range of 3350 to 4000kc and a suitable power supply providing filament and DC plate power.
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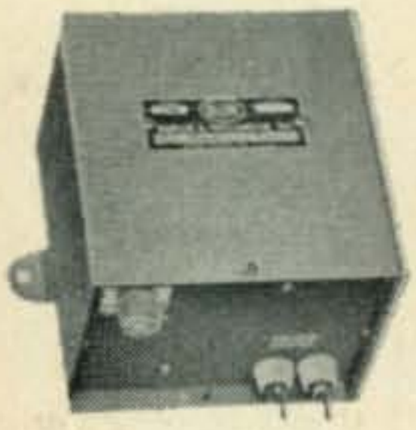

will match an unbalanced power source to a balanced load. Provide maximum transfer of power, maximum signal-to-noise ratio, minimum SWR, and minimum line radiations. Designed to fit rotary-type antennas. No tuning required for installation except adjustment to the "T" match. **Single Band Beam Balun:** 75 ohms unbalanced to "T" bar section. Compact, weatherproof construction utilizing precision, high quality components. Dimensions: 3½" x 3½" x 4". Weight: two pounds.

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F7076	115VAC	6.3V 10A	7 lbs.	2.95
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Model	Weight	Model	Weight
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For further information, check number 3, on page 110

If you are planning a trip to Europe this Summer do see Switzerland and meet some of her fine hams—and I hope you'll stop in and see me too.

We are answering our correspondence (between our travels) as quickly as we can. If you are missing a reply, please remember we answer those letters which contain a self-addressed stamped envelope first. Ever try to answer a pile of hundreds of letters? It takes time. We are doing our best. As we have said before, we do not know it all, and sometimes we miss. If we do not have the info you seek, we tell you so. For this month, 73 and 75 to our readers the world over. Chuck

USA-CA [*from page 65*]

Conditions: KH & KL count both state & country. Associate members count ½ credit but fully for state or country. Endorsements AOMB/M. K6BX as Chapter's 1963 Royal Wolf counts one credit for contacts 1960-1963. Contacts with Chapter's Royal Huntress, KØRGU, count two credits. Send alphabetical GCR list with full log data and $1 or 10 IRC to custodian, Tillie Currington, KØRGU. For seals and or endorsements, send s.a.s.e. or 1 IRC or return postage as applicable.

Just today we received application from Kay, K2UKQ for CHC-200 awards which makes Kay first YL in world to hold over 200 amateur radio achievement credits and in line for the Arne Trossman Top Honors Plaque. Kay has proved beyond any doubt that YLs can compete with the best of hamdom's OMs. We will bring you the K2UKQ story in later issue (this but a flash) but feel free to send Kay a message or note of congratulations. If you were not already aware, Kay was CHC's 1962 "Queen of the Hunt".

What's Cooking Department

While you're reading this Old Man K6BX will be back East. Having attended the Dayton Hamvention now we will be visiting various CHC Chapters which includes two in the Cleveland, Ohio Area where we will spend a few days talking over CHC October Convention plans. About time we had a vacation of sorts.

When we get back to Bonita we'll probably have final dope on the Washington State County Award and the Alabama State County Award, both being co-sponsored at state governor level as part of the USA-CA Program. There are dozens of new awards being sponsored each month or old awards rules being upgraded in standards. Impossible to bring you all such matter in this limited column, so to keep abreast of a fast changing awards field, suggest you subscribe to the *Directory of Certificates and Awards which* provides a quarterly revision service . . . yes, K6BX is editor and publisher of the *Directory* . . . that's how we are able to scoop practically all awards news in this column . . . while in Dayton we will check on progress those low cost QSLs previously promised. The 'pilot' and the Lord willing, we'll see you next month with many items hot off the griddle. Old Man,K6BX

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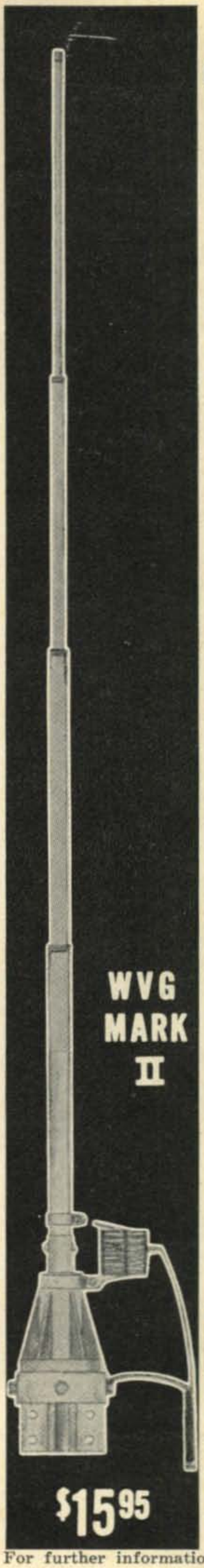

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For further information, check number 25, on page 110

Novice [*from page 67*]

Theodore Jones, Jr., 194 Brunswick Avenue, Trenton, New Jersey needs help with code and theory to obtain his ticket.

Thanks for helping these aspiring amateurs to get on the right road to a iifetime of enjoyment and possibly a future in electronics. If you need help, just send full particulars to Walter G. Burdine, W8ZCV, Waynesville, Ohio and I will set the wheels rolling. Do not send my mail to New York, that only slows it down.

The shoe also fits the other foot and Richard B. McCreary Jr., KØLGD, 4009 Valley Way, Independence, Missouri, Code 816 FLEMING 3-1369 will help any one really interested and willing to work for the license so that he may enjoy this most rewarding hobby. Thanks Richard, we need more like you. With that I will say good DX and 73.

Walt, W8ZCV

RTTY [*from page 71*]

ing switch on the telegraph key. Reverse this procedure to go from transmit to receive. That's all there is to it.

We are greatly indebted to Cliff Falls, K8JIC of Allen Park, Michigan, for the above details. Cliff uses his Marauder with a Heathkit Warrior kilowatt linear; on 40 and 80 mostly.

7040 kc vs. 7140 kc

For a period of several months in 1961, *QST* was listing 7040 kc for RTTY while *CQ* was listing 7140 (This happened to be about the same period during which W2JTP was relocating back to New York.) As the result we received the following letter, dated November 11, 1961, from K2SKK, then NCS of the East Coast RTTY Net:

"At the RTTY Dinner/Meeting last March 1961, Merrill Swan W6AEE proposed that amateur RTTY change its forty meter operating frequency from 7140 to 7040 to get away from the blasted foreign commercial interference on 7140. This was a request from certain DX RTTY stations who find it impossible to work anyone on 7140. It was my understanding that since all were in favor of this at this dinner, plus the RTTY Meeting in Boston the weekend before, that this was official thereafter. The RTTY gang on the west coast were all in favor as reported by W6AEE. The ARRL was duly notified by W6AEE and myself in separate letters, and you will note that *QST* publishes 7040 as the forty meter RTTY spot frequency. . . . Could you correct this notation in *CQ* Magazine and perhaps write a blocked paragraph explaining the move to 7040? If you want more information on this, contact Merrill W6AEE."

This should answer the many questions we have received as to, "How come?" The question, "Why?" was pretty well answered by W6CG in the January 1963 issue of *RTTY*, with a view from the west coast. The view from the east coast, though, has been rather dismal. W2JTP, who does much more listening than transmitting,

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NORTHEAST. SEE SAMPLES BELOW.

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For further information, check number 43, on page 110

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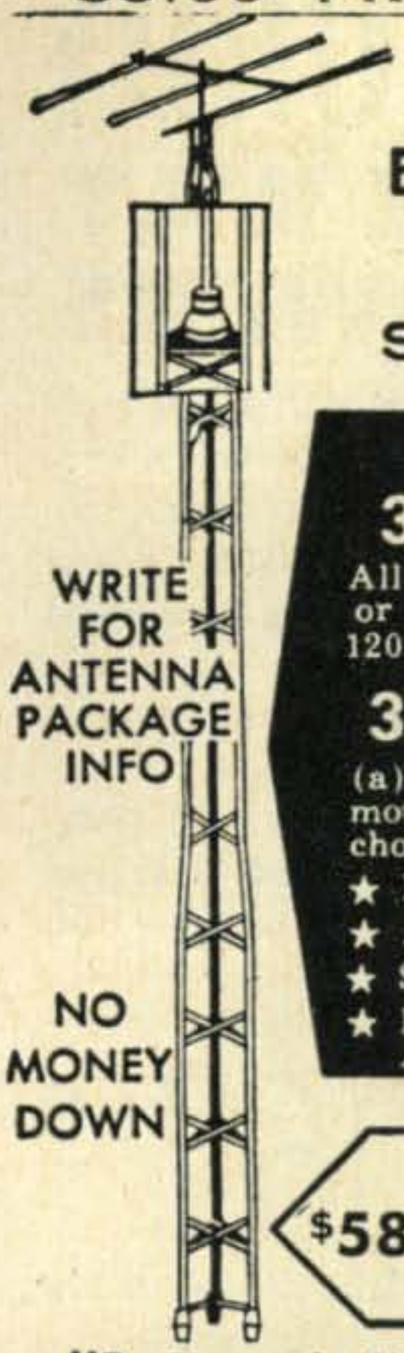

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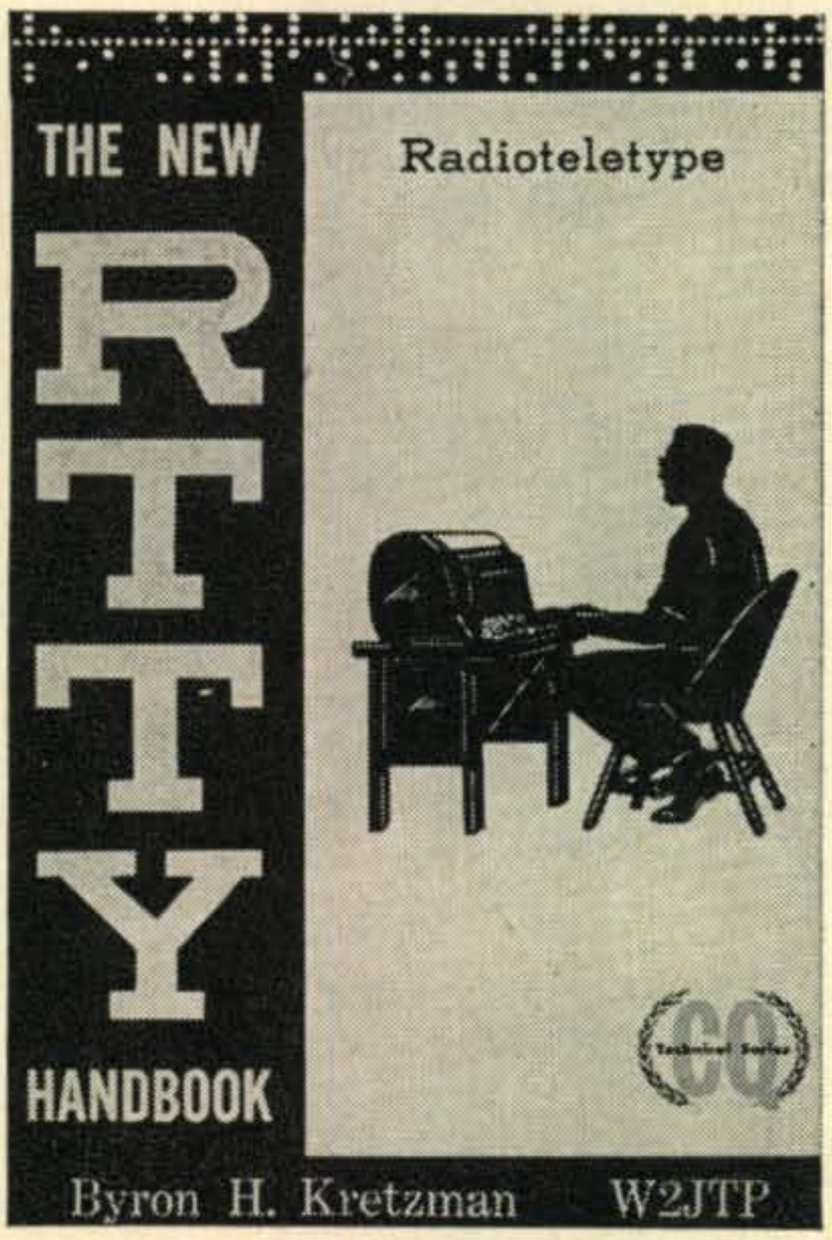
For further information, check number 43, on page 110 | For further information, check number 44, on page 110

"THE NEW RTTY HANDBOOK"



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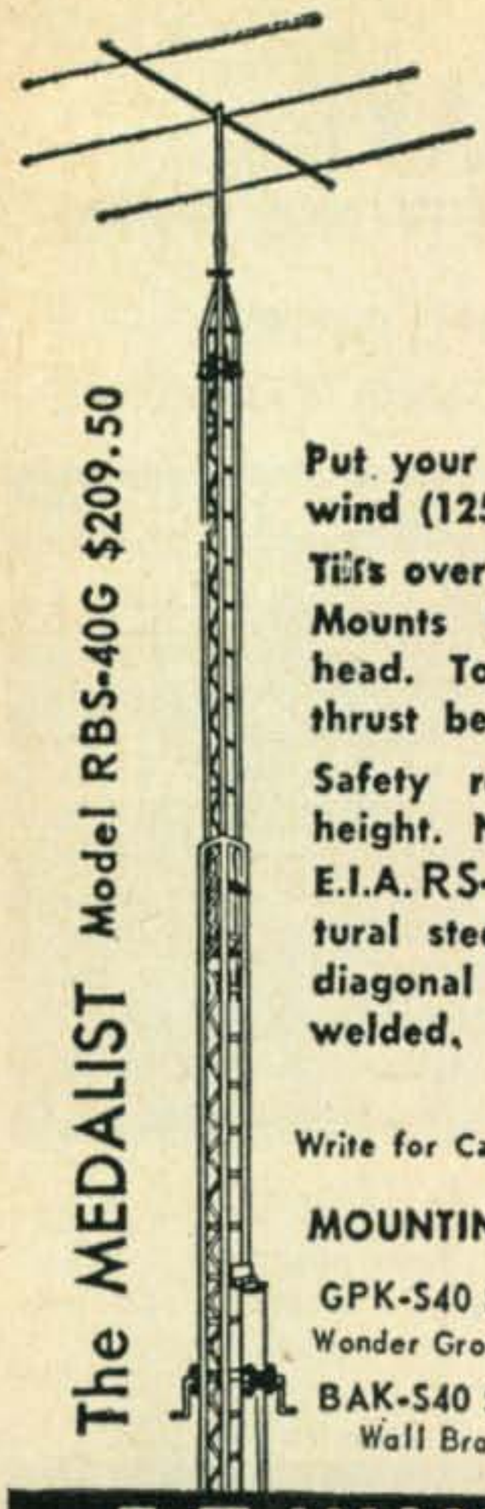

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For further information, check number 22, on page 110

has never heard anyone on 7040. W2PBG, a very active local, has run CQ/RY tapes on 7040 for hours without result. The foreign BC situation on 7140 does not seem too bad, and of course, the c.w. QRM is less. If we are going to "pull together" as W6CG says, we would like to suggest that we *all* get on 7040 and plow a furrow there with tapes and kilowatts. The QRM we can beat, but the lack of activity we cannot.

Comments

In the March RTTY COLUMN we proposed that 146.70 mc be established as the "national" RTTY channel for 2 meters. We gave several reasons, which boil down to just why we think an RTTY channel *should* be established: In the high density areas (New York, Chicago, *etc.*) it is desirable to confine such activity to a specific channel, thereby leaving more room for others; and, in the low density areas (midwest, *etc.*) it is desirable to have an established common meeting ground so that everyone knows where to look for RTTY. So this is basically why we feel that regional determination is not adequate. As soon as a few more areas report we will give you a run-down on opinion across the nation. Watch for it. 73, Byron, W2JTP

YL [*from page 70*]

K5UIH, Helen; treas., K5PLO, Jean.

Congratulations to W5DVV, Shirley Freeman, for earning WPX on s.s.b. Shirley received award #120, one of the very few YLs to make it to date.

K5ADQ, Nikki, has had a very busy year as editor of the weekly *West Gulf DX Bulletin,* but she still manages to pull in a few new ones, tallying over 280.

K8MZT, Shirley Rex, treasurer of YLRL for 1963, and chairman of the 1964 International Convention celebrating YLRL's 25th anniversary. For write-up on Shirley see Nov. '62 CQ.

WRONE Luncheon

W1RLQ sends news of the WRONE spring luncheon (smorgasbord), which will be held May 11 beginning at 12 Noon at the Svea Gille Restaurant Club, 190 S. Quinsigamond Ave., Shrewsbury, Mass. Send reservations ($2.50) to Carol Rice, K1VME, 14 Oakview St., Worcester, Mass. before May 4. 33, W5RZJ

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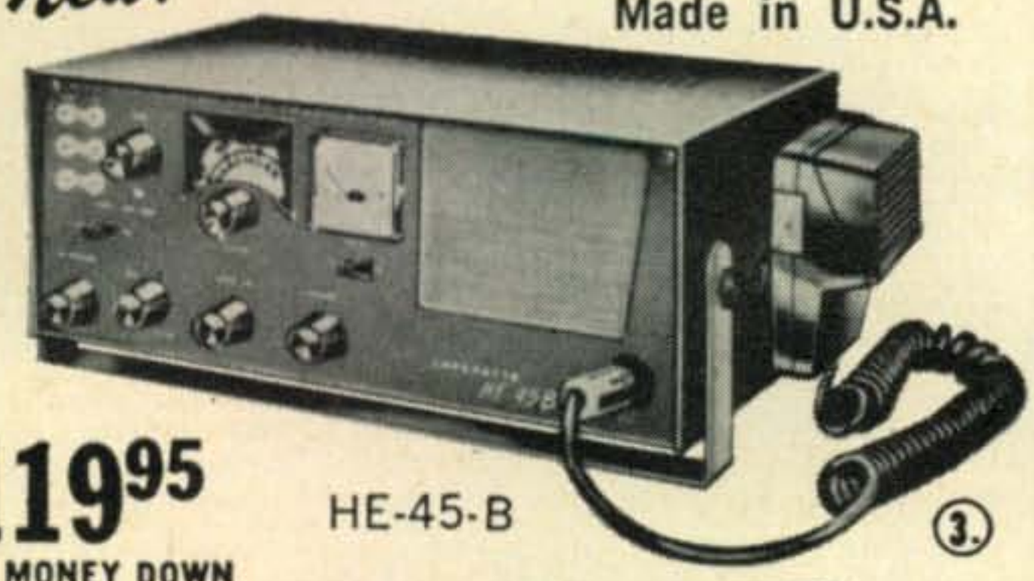

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For further information, check number 40, on page 110

220mc. Information Frequency, Equipment, Schedules. Postage Returned W9DJ.

STILL LOOKING for old wireless gear before 1925. Will pay good money or trade and particularly want certain spark equipment, a C.R.L. Paragon with amplifigon or matching tube panel, De-Forest Type O radiotelephone with tubes, catalogs, government call books and other books. File of QST's is almost complete but need a few issues of 1916, 1917, 1919 and 1923. If you are lucky, enough to own any copies I need, I will pay real money for them. I want them that badly. Also need quenched sections number SE1001 for SE1075 ship transmitter. In writing please give complete information plus price or specify what you need. W5VA/W5AI, T. Frank Smith, P.O. Box 840, Corpus Christi, Texas.

FOR SALE: Complete instructions including 28 page booklet and 22" x 36" schematic for converting the ART-13 transmitter to a.m. and s.s.b. Satisfaction guaranteed. $2.50 Sam Appleton, 501 N. Maxwell St., Tulia, Texas.

COMMUNICATION Teletype unusual surplus bargains, Free flyer. MDC-923 W. Schiller, Phila. 40, Pa.

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READY CASH for your AN/GRC, PRC, TRC, TCC, ARC, all Military communications Equip't. Also test gear: TS-; AN/UPM, URM, etc. We Pay Freight. Call K2BBC collect at TR 8-5222 or Write Space Electronics Co., 218 W. Tremont Ave., Bronx 53, New York.

WANTED: Military and commercial laboratory test equipment, Electronicraft, Box 399, Mt. Kisco, N. Y.

WANT CU-286/FRR Antenna Coupler. N. K. Thompson Millinocket, Maine.

ATTENTION! Swap equipment, components with other hams! Many interesting offers in Equipment Exchange. Sample copy free! Write: Brand, Sycamore, Ill.

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SWAN owners We will convert your present Swan Monobander or Tribander to 450 Watts p.e.p. input, using two 6DQ5 in final amp. parts, labor and one 6DQ5 $39.95, your present Adcom or Topaz supply will handle extra power Outercom of California, 10550 Burbank Blvd., North Hollywood, California.

THE Ham Trader-Magazine devoted to sale of amateur radio equipment. Advertise free, pay when you sell, subscription 6 issues $1.50. 25¢ copy. Information—The Ham Trader, Box 153 Dept. C, Franklin Square, N. Y.

WANTED Radio correspondence course, also back issues of Electronic World and Popular Electronics. Thomas Condon, 321 Moreland St., S.I. 6, New York City.

MODEL 19 teletype machine for sale. This machine is complete and is in very good condition. Sorry, will not ship but will crate. Contact Larry, K9BJM, Hoopeston, Ill.

FOR SALE Bandmaster Deluxe Model TBS-50D transmitter with power supply. Also Hallicrafter Skybuddy & converter. $125. Dr. Ralph Racicot, 8 Elm St., Southbridge, Mass.

SHAWNEE HW-10 perfect condx make offer Jeff W9FWK, 1549 Atchison Ave., Whiting, Ind.

NIKON F Camera, fl.4 lens, Photomic system, case. Absolutely brand new with factory guarantee, never used, $295, or will consider deal on ssb gear. W1RGX, Leonard Hart, 88 Marshall St., Medford, Mass.

SELL KWM-2 purchased Dec. 62, Ser. 13642 $940; A.c. pwr. supply $90; VFO-matic for 75 A receivers, $80; Johnson Match-box-275 watts, $30; all guaranteed perfect, F.O.B. Lamb, 1219 Yardley Road, Morrisville, Pa.

NEED money for further work with radio? Sell your old toy trains. Send description including make and numbers, also price desired to Edward H. Wichmann, New Lennox Station, Lenox, Mass.

PREMIUM quality reconditioned equipment! Terms! Trials! Trades! World's largest stock! Collins KWM-1 $399; 32V-2 $199; 32V-3 $249; 75A-1 $299; 75A-2 $269; 75A-3 $329; 75A-4 $429, 75S-1 $349; Globe Chief 90 $39.95; Gonset GSB-100 $329; G-77 w/mod. & p/s 6-12V $129; Commanche $94.50; Knight T-50 $29.95. Leo, WØGFQ, Box 919, Council Bluffs, Iowa.

"Hi! I'm Lowell McNeil, W9PTN, president of the West Racine Bank in Racine, Wisconsin. As a banker, I can assure you that Collins radio equipment is an excellent investment. It has quality, performance and top trade-in value. These are the things we bankers look for. Many banks offer special finance rates on Collins equipment, just as Terry is offering here. I have KWM-1 at the office and a complete Collins station at home. I've been 'all-Collins' for many years."

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62S-1 VHF Converter	895.00	70.48	36.91	21.44
75S-3 Receiver	680.00	53.55	28.05	16.29
75S-3A Receiver	750.00	59.06	30.93	17.96
KWM-2 Transceiver	1150.00	90.56	47.43	27.55
KWM-2A Transceiver	1250.00	98.43	51.56	29.94
51J-4 Receiver	1464.00	115.29	60.39	35.07
51S-1 Receiver	1828.00	143.95	75.40	43.79
351D-2 Mobile Mount	120.00	9.45	2.87	3.03
MP-1 14V DC Power Supply	198.00	15.59	8.16	4.74
PM-2 Portable Power Supply	150.00	11.81	4.55	3.59
CC-2 Carrying Case	85.00	6.69	3.50	2.03
CC-3 Carrying Case	107.00	8.42	4.41	2.56
516F-2 AC Power Supply	115.00	9.05	4.74	2.75
312B-4 Speaker Console	195.00	15.35	8.04	4.67
312B-5 PTO Console	350.00	27.56	14.43	8.38
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For further information, check number 17, on page 110

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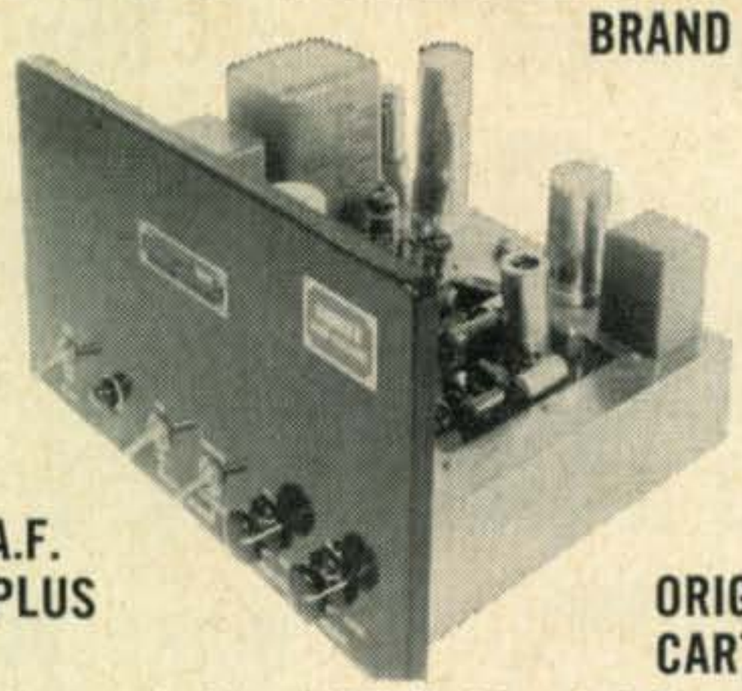

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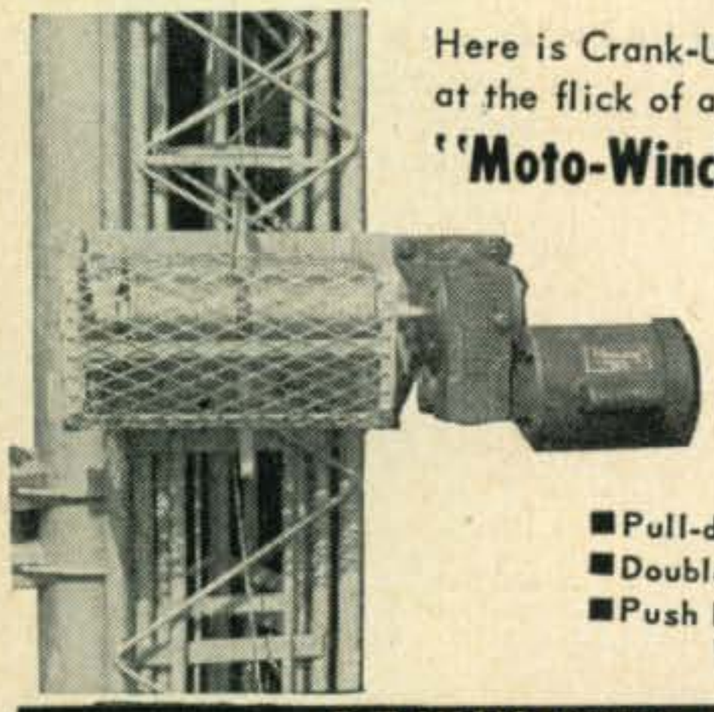

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4-1000A $50. BC-1031-C Panadapter $100. Jennings UCSX-1000 Vacuum Variable $150. Pair 4X250B's $35. Pair 813's $15. All tubes new. C.R. Kral, W3ZYG, 3269 Thornwood Dr., Bethel Park, Pa.

SELL Collins 75A-4, #2163, with speaker $440, Hallicrafters HT-32A, #230705, $400 with manuals and in good condition. Both for $815, or best offer. No trades. Rule, W4ZUK, 2817 North Atlantic Boulevard, Ft. Lauderdale, Florida.

WANTED Pair of 833's, 304TL's, 450TH's, etc. Also need 810's. Must be reasonable. I. Natoli 160-10 89th Ave. Jamaica 32, N.Y.

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SELLING out. Send addressed envelope for list. NC-240D receiver, NC-183 receiver, antique radios trans. tubes, meters, power supplies, equipment, components, Collins 310B, other gear. Will trade for 4-1000, hi power linear parts, old QST's. Dundee W5CNF, 2119 S. Detroit, Tulsa, Okla.

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WILL PAY two dollars each for 1945 copies of CQ. Erv. Rasmussen, Box 612 Redwood City, Cal.

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COAXIAL RELAY spdt, 6 volt coil, panel mounting, $5. Brass Navy type M synchros, 60 cycle, $5. each, $8. per pair, R.M. Ellis, East Pike, Indiana, Pa.

FOR SALE RCA BK-6B lavalier dynamic mike, cost $92; Electro Voice Model 666, cost $150 Make an offer. G. Ritscher, Mail Rm 8, Chanute AFB. Illinois.

FOR SALE cleaning shack. KWM-1 with mobile mount and 516E1 power supply, cables, instruction book. $450, or best offer. Gonset Twins G-66B, G-77A, 3201 Modulator and 12vdc-117vac power supply, 3029 12 vdc-117vac power supply with speaker, Model 3071 mounting kit and cables. Books included. $300, or offer. Model 26 Teletype on Bell system table with automatic carriage return and line feed. Will not ship teletype. Need Berkley or equal EPUT and R390A receiver. Will buy or trade. Dave Chapman 670 No. Elizabeth St. Lombard, Illinois, MA 7-6026.

FOR SALE wonderful values. HT-33A Linear (final tube, PL172 like new), $375; Collins 75A-4 and spkr, with three filters $400; HT-32 perfect $325. W4IBS, 122 Sarto Ave., Coral Gables, Fla.

MODEL 14 Teletype for sale $70. W5MAA, 501 E. William David Parkway, Metairie, La. Telephone: VErnon 5-2977.

SELL 75S-1, used 30 hrs. $335. MM2 scope used 2 hr. $75. Hy-Gain RBXI rotator & Map new unpacked $90. All purchased new. M.E. Brown, 1032 Lee Ave., San Leandro, Cal.

DESIRE either 2m or 6&2 transceiver ready to operate. Trade two new quality cameras and darkroom equipment. Graflex 2¼X3¼ back permits color and B/W. Special back permits 2¼X3¼ B/W, color, slides. Filter & flash, shade, G.E. lightmeter and shoulder bag, a beauty. Kodak Motormatic case, flashfilter, small shoulder bag. These items can't be told from absolutely store new. Will sell in any combination with or without receiver. B.T. Scharbach, 317 Birney, Essexville, Michigan.

GOING homebrew! Apache $215, SB-10 $85, Mohican $95, DX-35 $40, DSB-100 $75. W6BPL, 1850 West Willow St., Stockton 3, Cal.

FOR SALE SX-100 less spkr. $150 plus shipping. This set is in real fine shape. Robert Burns, 522 E. Center St., Warsaw, Ind.

WANTED Gonset tuner 108-128 mc and 6 meter linear #3212. For sale or swap for above: Gonset Tuner 152-162 mc. Richard M. Jacobs, WAØAIY, 1015 Glenside Place, University City 30, Missouri.

FOR SALE Heath HR-10 Receiver $65 New, Eico 720 Transmitter & 730 Modulator Both for $75. KØHKB, "Vern" 1695 So. Wolcott, Denver 19, Colorado.

SELL DX-35 $35. Globe Chief-90 $35., Viking Mobile $45., Gonset Super Six $20., Heath VF-1 vfo $15., RME 84 $55., Navy RAL-8 with power supply $50., PE-157 power supply $10. Ray Henderson, KØLJS Morrill, Nebraska.

FOR SALE Hammarlund receiver HQ-100 A with speaker, General coverage as new, best offer. R. Bennett, 138 Eagle St., Albany, New York.

COLLEGE bound—Deluxe six meter station—HQ-110 receiver, clock and speaker. Lettine 242 transmitter, Lettine vfo. Telrex 6-el beam, Alliance rotator, 100 feet coax. Gonset modulation meter, Ameco Conelrad monitor, On-the-Air sign, Ameco low-pass filter, 2 Dow-Key relays, station control unit, RCA WV-38A vom, Pocket size vom, 2 mikes (crystal and carbon), homebrew 350 volt 250 ma power supply, 3 crystal ovens, plus brand new components worth over $400; resistors, capacitors, tubes (5Y3's, 6146's, 5763's, etc.) potentiometers, and much more. $500. Will ship—send for details. Howard Fruchter WA2DCM, 589 Barnard Ave., Woodmere, N.Y.

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KWS—1+75A4 $1200 for both. Gonset Communicator IV 2 meters $200 or best offer over. All A-1 condition. Will ship. W5VPN 1300 Walter N.E., Albuquerque, New Mexico.

ENGLAND. Established radio and TV company would distribute ham gear throughout England and Europe, arranging demonstrations and storage, etc., money transfers arranged. Excellent references. Contact S.G. Spiegler, G3RIA, Spiegler Ltd., 898 Garratt Lane, London, S.W. 17, England.

26 TYPE Teletypewriter complete with converter, best offer or will trade for mobile equipment. W8DRV, 7761 Big Creek, Cleveland 30, Ohio.

ATTENTION CD radiological officers: Have precision 111 Scintillator, new, cost $400. Want complete 12v mobile rig, preferably Elmac or will sell. Make offer. F. Durfee, Perry, N.Y., WA2TFO.

SELL TX-174 freq. meter w/book, $115, TX-175 freq. meter w/book $115; Deluxe signal shifter w/coils 160 thru 10 like new $24, motor driven vacuum variable 20-675 mmf 10kv $60; W.U. Mod. 4604A reperf. tty. $25 w/base, Mod. 14 tty perf. w/110 vdc 1/2a. p.s. $55. W8MTI, Onondaga, Mich.

FOR SALE Elmac AF-68, PMR-8, 1070 ac-dc power supply, $300; HT-37, $335; SX-111, $180; all mint condition, F.O.B. Milwaukee; terms available, my bank or yours, Laurence Luff, 4840 W. Fond Du Lac Ave., Milwaukee 16, Wis.

WANTED Clock, 24-hour, model TD-2400; Heath crystal calibrator, model HD-20; Eico grid-dip meter, model 710. R. L. Wildman, 469-9th St., Phillipsburg, Kansas.

FOR SALE 1-Viking Kilowatt, complete with right hand desk, $800; 1-Viking Ranger, $150; 1-Viking Pacemaker, $200; 1-70 Rohn Tower Model 25, $70; 1-Mosley 40 meter beam, $50; 1-SX-101 Receiver, $200, with speaker; 1-SX-88, with speaker, $400; 1-Globe King 500C, $400. All gear my personal ham shak and guaranteed by K5YUA, Melvin Rogers, 301 N. Canal, Carlsbad, New Mexico.

416B TUBES Good—Used—Unboxed. Guaranteed. $10 each. K6SQT, Box 2194 Pine Grove, California.

SELL HT-33 Excellent Condition $300. or best offer and will deliver 100 miles. Donald Farrell—WA2WEE, Chittenango, N.Y.

SSB-100F transmitter for sale. Finest ssb-cw-am transmitter available. Full 100 watts output on all bands 10 through 80 meters. Popular for vhf ssb. Xtal-lattice filter. Beautiful audio. Excellent cw keying. Rock-stable permeability tuned vfo. Built-in scope. Adjustable pi-net output to match antenna Amplifier. Like new, perfect condition, in factory carton with manual. Cost $795. Sell for $395. Will ship. W9FSW, 119 Rassi Ave., Morton, Illinois.

FOR SALE R-388/URR receiver $250; Viking invader (new) $500; TT-55/mgc teletype $100; Magnecorder tape recorder $100; TV50 Genometer $25. Simpson 480 Genescope $100; 4X250 B tube $10; used Vidicon tube 6198—$25; used Motorola 2-way radio & BC-1031C Panoramic adapter. Harry L. Parker, P.O. Box 303 Georgetown, So. Car.

WANT 220 432 gear. W9DJ.

HAMFEST Starved Rock Radio Club Picnic near Ottawa, Illinois June 2 at LaSalle County 4-H Home. Registration $1.50 if postmarked before May 26. Write W9MKS, RFD 1, Box 171, Oglesby, Ill.

ATTENTION Swap equipment, components with other hams! Many interesting offers in "Equipment Exchange." Copy free! Write: Brand, Sycamore, Illinois.

BRAND NEW HE-50 10 mtr. xcvr—Reg. $114.50, now $79.50—Limited Quantity— Easily Converted to CAP frequencies—available only from our Jamaica, N.Y., location. Many other Low, Low Prices—come in for an eyeball QSO! Ham Room, Lafayette Radio, 165-08 Liberty Ave., Jamaica, N.Y.

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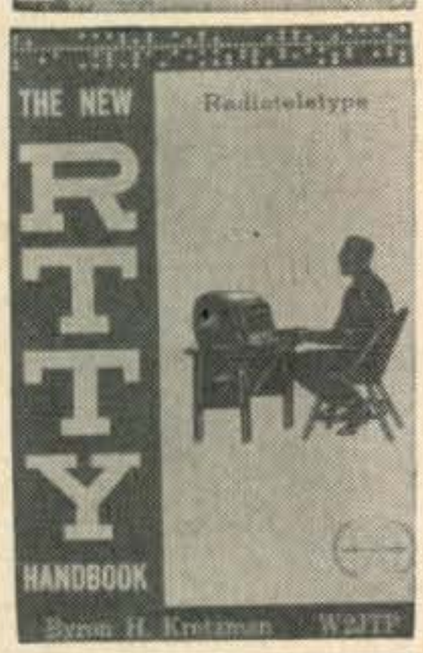

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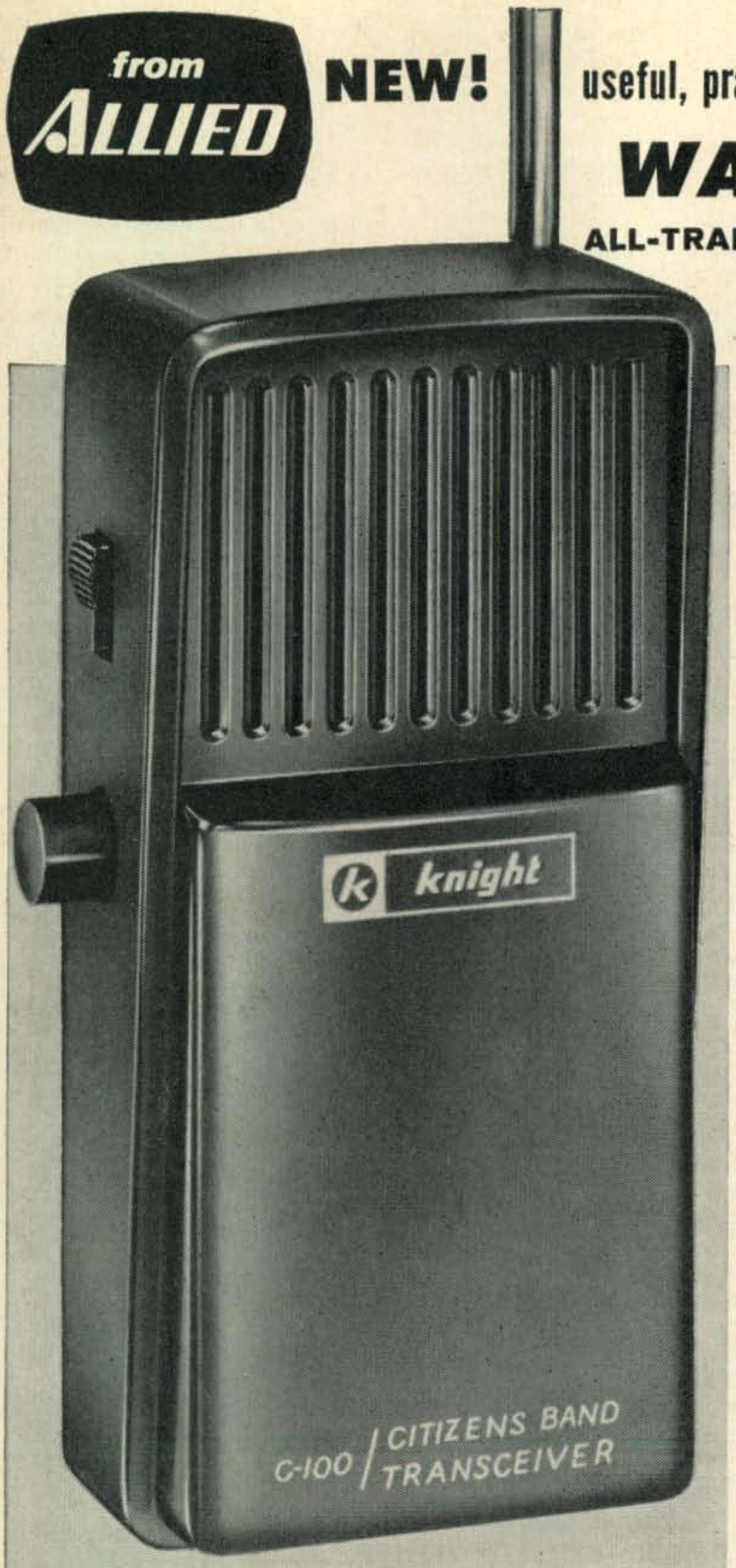

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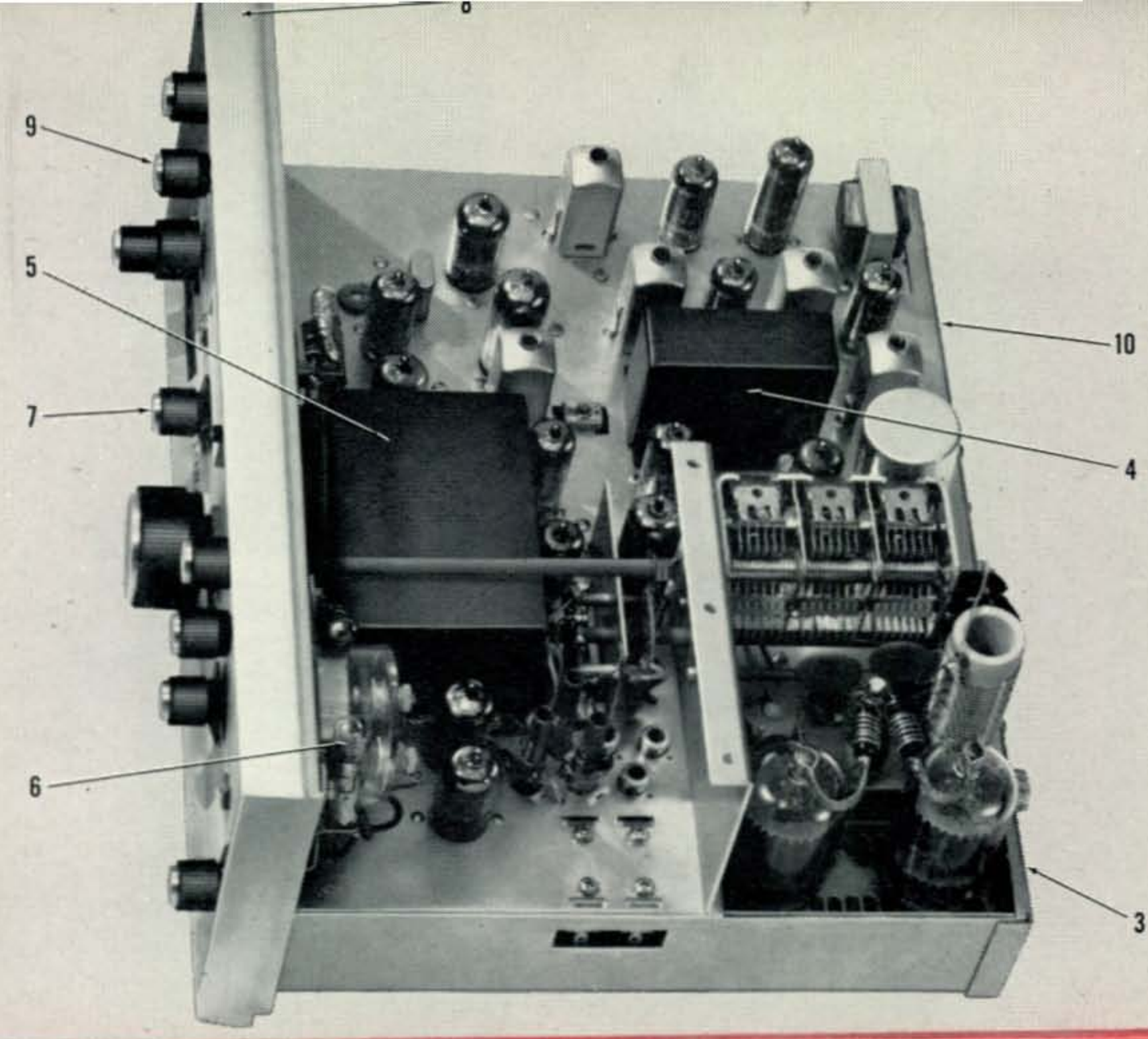

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For further information, check number 6, on page 110.

You are looking at a special demonstration of "DARK-HEATER" design. The heater on the right is a "DARK-HEATER." It operates at approximately 350° K lower than the 1500 to 1700° K of the conventional heater, on the left. The much lower temperature "DARK-HEATER" produces the same cathode temperature as the conventional heater—**because of the superior thermal emissivity of the dark coating.**

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13.5-VOLT
"DARK-HEATER"

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